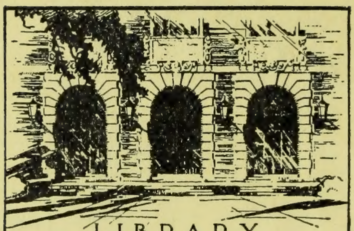

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ANNUAL REPORTS

OF THE

WAR DEPARTMENT

FOR THE

FISCAL YEAR ENDED JUNE 30, 1904.

VOLUME VI.

REPORT OF THE CHIEF OF ENGINEERS.

PART 2.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1904.

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ARRANGEMENT OF THE ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE YEAR ENDED JUNE 30, 1904.

Volume I............Secretary of War:
- Chief of Staff.
- The Military Secretary.
- Inspector-General.
- Judge-Advocate-General.

Volume II......**Armament, Transportation and Supply:**
- Quartermaster-General.
- Commissary-General.
- Surgeon-General.
- Paymaster-General.
- Chief of Engineers, Military Affairs.
- Chief of Ordnance.
- Chief Signal Officer.
- Chief of Artillery.
- Board of Ordnance and Fortification.

Volume III......**Division and Department Commanders:**
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- Northern Division—
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Volume IV......**Military Schools and Colleges; Militia Affairs, Military Parks, and Soldiers' Homes.**
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Volume X............Chief of Ordnance.

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APPENDIXES

TO THE

REPORT OF THE CHIEF OF ENGINEERS,

UNITED STATES ARMY.

(CONTINUED.)

APPENDIX L.

IMPROVEMENT OF NORFOLK HARBOR, VIRGINIA, AND ITS APPROACHES, AND OF CERTAIN WATERWAYS AND HARBORS IN SOUTHEASTERN VIRGINIA AND NORTHEASTERN NORTH CAROLINA.

REPORT OF CAPT. E. EVELETH WINSLOW, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDED JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORK.

IMPROVEMENTS.

1. Harbor at Norfolk and its approaches, Virginia.
2. Western branch of Elizabeth River, Virginia.
3. Hampton Roads, Virginia.
4. Nansemond River, Virginia.
5. Pagan River, Virginia.
6. Appomattox River, Virginia.
7. Harbor at Cape Charles City, Virginia.
8. Waterway from Norfolk, Virginia, to the sounds of North Carolina.
9. Inland water route from Norfolk, Virginia, to Albemarle Sound, North Carolina.
10. Edenton Bay, North Carolina.
11. Roanoke River, North Carolina.
12. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS AND SURVEY.

13. Perquimans River, North Carolina.
14. Waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

HARBOR LINES.

15. Smiths Creek, at The Hague, Norfolk Harbor, Virginia.

ENGINEER OFFICE, UNITED STATES ARMY,
Norfolk, Va., July 16, 1904.

GENERAL: I have the honor to transmit herewith my annual report upon the works of river and harbor improvement, now in my charge here, for the fiscal year ended June 30, 1904.

Very respectfully, your obedient servant,

E. EVELETH WINSLOW,
Captain, Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

L 1.

IMPROVEMENT OF HARBOR AT NORFOLK AND ITS APPROACHES, VIRGINIA.

(A) GENERAL IMPROVEMENT.

No actual work toward improvement was performed during the fiscal year 1904.

The expenditure reported was disbursed for a survey and map to secure data for the establishment of harbor lines.

The available funds and the amount recommended will be applied to dredging at such localities as may be authorized. The project is about 92 per cent completed.

Money statement.

July 1, 1903, balance unexpended		$21,965.16
June 30, 1904, amount expended during fiscal year, for works of improvement		914.61
July 1, 1904, balance unexpended		21,050.55
Amount (estimated) required for completion of existing project		36,774.56
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$36,774.56	
For maintenance of improvement	50,000.00	
		86,774.56
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

(B) HOSPITAL POINT.

During the fiscal year work was begun under the contract described below and resulted in the removal of all trees upon the portion of the point to be cut away, the excavation of a trench for a new sea wall, and the building of 216 feet of this sea wall. Dredging was commenced March 7, 1904, and at the close of the fiscal year 202,088 cubic yards, scow measurement, had been removed, this dredging being over an area of 19.55 acres to a depth of 25 feet at mean low water. The project is about 15 per cent completed.

The amount unexpended at the end of the present fiscal year will suffice to complete all the work contemplated under the adopted project.

Money statement.

July 1, 1903, balance unexpended	$192,487.75
June 30, 1904, amount expended during fiscal year, for works of improvement	18,096.32
July 1, 1904, balance unexpended	174,391.43
July 1, 1904, outstanding liabilities	6,891.81
July 1, 1904, balance available	167,499.62
July 1, 1904, amount covered by uncompleted contracts	157,266.77

APPROPRIATIONS.

Improving harbor at Norfolk, Va.:	
August 14, 1876	$35,000.00
June 18, 1878	50,000.00
March 3, 1879	75,000.00
June 14, 1880	50,000.00
March 3, 1881	75,000.00
August 2, 1882	75,000.00
July 5, 1884	25,000.00
August 5, 1886	50,000.00
August 11, 1888	50,000.00
September 19, 1890	150,000.00
Improving harbor at Norfolk, Va.—Continued.	
July 13, 1892	$150,000.00
August 18, 1894	100,000.00
June 3, 1896	100,000.00
June 13, 1902	30,000.00
March 3, 1903	183,957.00
Improving Elizabeth River, Virginia:	
July 7, 1898	360,000.00
Total	1,558,957.00

Amount turned into surplus fund of the Treasury from appropriation of July 7, 1898	483.58
Aggregate	1,558,473.42

CONTRACT IN FORCE.

With Sanford & Brooks Company, for dredging, etc., dated January 14, 1904; approved January 30, 1904; work commenced February 1, 1904; date for expiration July 31, 1905. Prices: For dredging, 9¾ cents per cubic yard, scow measurement; for removing wharf, buildings, etc., and reconstructing same, $3,485; for demolishing sea wall and rebuilding same, $6,585; for removing trees, etc., $370; for repairing drives and walks, $250.

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the harbor at Norfolk, Va., during the calendar year 1903 were compiled from statements furnished by parties making shipments over this waterway:

Articles.	Amount.	Value.
	Tons.	
Fertilizer	170,950	$3,022,000
Brick	32,000	66,000
Shingles	25,000	145,000
Logs	757,274	920,421
Grain	20,220	404,378
Oysters and fish	65,500	655,000
Lumber	603,983	4,227,881
Coal	2,474,207	7,184,621
Shells	20,500	23,500
Ice	27,000	56,500
Pig iron	24,824	446,832
Miscellaneous	5,257,442	623,668,675
Total	9,478,900	640,820,808
Cattle ...head	3,279	327,900
Aggregate		641,148,708

Greatest draft vessel, using channel during calendar year 1903, was 29 feet 10 inches.

A daily line of steamers between Norfolk, Va., and Richmond, Va., was established during the the calendar year 1903.

L 2.

IMPROVEMENT OF WESTERN BRANCH OF ELIZABETH RIVER, VIRGINIA.

No operations were carried on during the fiscal year.

Money statement.

July 1, 1903, balance unexpended	$333.27
July 1, 1904, balance unexpended	333.27

APPROPRIATION.

June 3, 1896	$45,000

COMMERCIAL STATISTICS.

The following statistics, indicating the commerce of the river during the calendar year 1903, were compiled from statements furnished by shippers:

Articles.	Amount.	Value.
	Tons.	
Logs	6,000	$36,000
Manufactured lumber	4,200	73,400
Merchandise and produce	1,199,992	11,999,920
Copper ore	15,517	77,585
Total	1,225,709	12,186,905

Vessels.

Class.	Number.	Average draft.
		Feet.
Steam	[a]20	10
Sail	150	4
Barges	11	8
Total	181	

[a] Daily.

L 3.

IMPROVEMENT OF HAMPTON ROADS, VIRGINIA.

The work of dredging the channel at this locality under the contract described below was commenced July 6, 1903, and work thereunder has been carried on continuously since that date up to the close of the fiscal year, at which date a channel through Middle Ground bar, 315 feet wide had been excavated to a depth of 30 feet at mean low water, and for a distance of 3,036 feet it had been given an additional width of 45 feet to the same depth. In doing this dredging, 894,846 cubic yards of material, scow measurement, were removed, of which amount 264,594 cubic yards, scow measurement, was paid for at the original contract price of 9 cents per cubic yard, and 630,252 cubic yards, scow measurement, at the additional price stipulated in the supplemental contract which was entered into November 30, 1903, which required the contractor to deposit the material on the south side of Willoughby bank in Hampton Roads, Virginia, as dumping the material about the middle ground light-house was objectionable to the commercial interests of Norfolk and Newport News, Va. The project is about 55 per cent completed.

The balance unexpended at the close of the fiscal year will be applied to continuing the work in providing the projected channel, and will be sufficient to accomplish this purpose.

Money statement.

July 1, 1903, balance unexpended	$223,953.83
June 30, 1904, amount expended during fiscal year, for works of improvement	111,401.93
July 1, 1904, balance unexpended	112,551.90
July 1, 1904, outstanding liabilities	12,041.91
July 1, 1904, balance available	100,509.99
July 1, 1904, amount covered by uncompleted contracts	98,822.59

APPROPRIATIONS.

June 13, 1902	$10,000
March 3, 1903	215,000
Total	225,000

CONTRACT IN FORCE.

With Coastwise Dredging Company, for dredging, dated May 18, 1903; approved June 6, 1903; work commenced July 6, 1903; date for expiration February 9, 1905. Price, 9 cents per cubic yard, scow measurement.

Supplemental contract.

With Coastwise Dredging Company, modifying provisions of above contract as to locality for dumping material, dated November 30, 1903; approved by Chief of Engineers, United States Army, December 15, 1903, and by Assistant Secretary of War, December 21, 1903. Price, 5½ cents per cubic yard, scow measurement, in addition to the 9 cents per cubic yard stipulated in the above-mentioned contract.

COMMERCIAL STATISTICS.

The following statistics were compiled from statements of the shippers at Newport News, Va., and indicate the traffic by way of Hampton Roads, Virginia, during the calendar year 1903:

Articles.	Amount.	Value.
	Tons.	
Coal	1,886,107	$5,658,321
Grain	98,015	2,098,737
Miscellaneous	842,436	84,243,600
Total	2,826,558	92,000,658
Cattle head	21,433	2,143,300
Aggregate		94,143,958

Vessels entered and cleared.

No accurate account of the number of coastwise steamers and sailing vessels could be obtained. The appended statement relates solely to foreign vessels:

Class.	Number.	Draft.
		Feet.
Steam	314	20 to 30
Sail	6	18 to 30
Total	320	

L 4.

IMPROVEMENT OF NANSEMOND RIVER, VIRGINIA.

The operations during the fiscal year on this stream were confined to dredging under two contracts. The work under the first contract was commenced October 6, 1903, and continued to December 16, 1903, resulting in the removal of 17,785 cubic yards of soft mud, at the contract price of 24½ cents per cubic yard, scow measurement, this material being deposited near the Middle Ground Light-House, in Hampton Roads. As the material thus deposited appeared to be injuring some of the minor but well-used navigable channels of the vicinity, this contract was terminated by a supplemental agreement. Work under the second contract was begun March 22, 1904, and completed March 30, 1904; 13,600 cubic yards, scow measurement, were removed and deposited in Chesapeake Bay east of Fort Wool, at the contract price of 25 cents per cubic yard. All of the dredging was done through a recently formed shoal just below the mouth of the Western Branch. Two cuts were made, each 40 feet wide and having an aggregate length of 5,085 feet.

The existing project is estimated to be about 50 per cent completed.

The amount recommended for expenditure will be applied to dredging where required.

Money statement.

July 1, 1903, balance unexpended	$9,322.89
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	9,266.85
July 1, 1904, balance unexpended	56.04
Amount (estimated) required for completion of existing project	[a]10,266.85
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	10,266.85
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

March 3, 1873	$15,000
March 23, 1874	10,000
March 3, 1875	5,000
March 14, 1876	5,000
June 18, 1878	2,000
August 11, 1888	10,000
September 19, 1890	10,000
July 13, 1892	$10,000
August 18, 1894	10,000
June 3, 1896	5,000
March 3, 1899	5,000
Total	87,000

CONTRACTS IN FORCE.

With Smith & Robinson, for dredging, dated June 19, 1903; approved August 13, 1903; work to be commenced October 1, 1903; work terminated by supplemental agreement dated December 14, 1903; approved by the Chief of Engineers, United States Army, December 21, 1903, and by Assistant Secretary of War December 26, 1903. Price, 24½ cents per cubic yard, scow measurement.

With Coastwise Dredging Company, for dredging, dated February 11, 1904; work to be commenced February 26, 1904; date of expiration, March 30, 1904. Price, 25 cents per cubic yard, scow measurement.

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the Nansemond River, Virginia, during the calendar year 1903, were compiled from statements of parties making shipments over this stream:

Articles.	Amount.	Value.
	Tons.	
Lumber	22,222	$180,334
Manufactured lumber	500	10,000
Merchandise	10,325	1,032,500
Oysters	1,200	15,000
Coal	1,500	6,000
Oyster shells	380	500
Total	36,127	1,244,334

---

[a] Expended for maintenance in current fiscal year, $9,766.85.

L 5.

IMPROVEMENT OF PAGAN RIVER, VIRGINIA.

No operations were carried on during the fiscal year. The expenditures were made in connection with an examination of the river and the plotting of a map from the notes of the examination. Work on the project has not yet been begun.

The available funds and the additional amount recommended will be applied to removing shoals.

Money statement.

July 1, 1903, balance unexpended	$10,863.05
June 30, 1904, amount expended during fiscal year for works of improvement	860.95
July 1, 1904, balance unexpended	10,002.10
Amount (estimated) required for completion of existing project	18,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	18,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

June 14, 1880	$5,000
March 3, 1881	5,000
June 13, 1902	10,870
Total	20,870

COMMERCIAL STATISTICS.

The following statistics represent the commerce of Pagan River, Virginia, during the calendar year 1903:

Articles.	Amount.	Value.
	Tons.	
Peanuts	38,319	$2,671,998
Coal	1,500	5,250
Oysters	7,857	74,250
Miscellaneous	72,445	5,673,350
Total	120,121	8,424,848

The Old Dominion Steamship Company operates two steamers on this river as far as Smithfield, Va., each making a round trip daily, except Sundays, from Norfolk, Va.

L 6.

IMPROVEMENT OF APPOMATTOX RIVER, VIRGINIA.

(A) MAINTENANCE.

The work of dredging under an agreement with Mr. C. P. E. Burgwyn, in progress at the close of the last fiscal year, was continued until August 31, 1903, 12,505 cubic yards of material being removed in cutting a channel through shoals just below the harbor at Petersburg to a width of 30 feet and a depth of 12 feet at mean high water. The cost of this dredging was 33 cents per cubic yard, place measurement.

The appropriation in the act of June 13, 1902, not being sufficient to cover the cost of all the dredging needed to restore a 12-foot mean high-water channel from Petersburg to Point of Rocks, an allotment of $5,000 was made from the appropriation for "Emergencies in River and Harbor Works," act of June 6, 1900, to continue the work of dredging. The work to be done under this allotment was arranged by an emergency contract, which is described below, and the work thereunder was commenced October 21, 1903, and completed January 31, 1904. Under this contract a total of 10,182 cubic yards of material, place measurement, was removed in dredging at various localities where the depth of 12 feet at mean high water did not exist, a cut being taken through each shoal 30 feet wide. The cost of this dredging was 36 cents per cubic yard, place measurement.

The amount recommended will be applied to work of maintenance and improvement. The project is about 85 per cent completed.

Money statement.

July 1, 1903, balance unexpended		$5,994.36
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 6, 1902		5,000.00
		10,994.36
June 30, 1904, amount expended during fiscal year:		
For maintenance of improvement	$10,657.96	
Repaid to appropriation	331.70	
		10,989.66
July 1, 1904, balance unexpended		4.70
Amount (estimated) required for completion of existing project		48,090.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$48,090.00	
For maintenance of improvement	10,000.00	
		$58,090.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

(B) AT PETERSBURG.

No actual work was done during the fiscal year, as it was only toward its close that part of the land needed for the work was acquired by the

United States. The expenditures were in payment for the land, for surveys, and for contingencies connected with the advertisement for proposals.

Under date of June 14, 1904, a contract was signed with the Atlantic Dredging Company, covering all the work comtemplated under the project. At the close of the year the contract had not received the approval of the Chief of Engineers, United States Army. At the prices stipulated in this contract, it will be possible to do all the work according to the plans, and the amount available will be applied thereunder.

Money statement.

July 1, 1903, balance unexpended	$198,488.96
June 30, 1904, amount expended during fiscal year, for works of improvement	8,644.62
July 1, 1904, balance unexpended	189,844.34
July 1, 1904, outstanding liabilities	.20
July 1, 1904, balance available	189,844.14
July 1, 1904, amount covered by uncompleted contracts	137,492.00

APPROPRIATIONS.

March 3, 1871	$50,000.00	August 18, 1894	$5,000.00
June 10, 1872	40,000.00	June 3, 1896	5,000.00
March 3, 1873	30,000.00	March 3, 1899	5,000.00
June 23, 1874	30,000.00	June 13, 1902	32,500.00
March 3, 1875	30,000.00	March 3, 1903	175,000.00
August 14, 1876	30,000.00	Emergencies in river and harbor works, act June 6, 1900	5,000.00
June 18, 1878	30,000.00		
March 3, 1879	20,000.00		
June 14, 1880	20,000.00		
March 3, 1881	20,000.00	Total	651,330.00
August 2, 1882	35,000.00	Repaid to appropriation for emergencies in river and harbor works	331.70
July 5, 1884	25,000.00		
August 5, 1886	18,750.00		
August 11, 1888	15,000.00		
September 19, 1890	15,000.00	Aggregate	650,998.30
July 13, 1892	15,000.00		

CONTRACTS IN FORCE.

Emergency contract with C. P. E. Burgwyn, for dredging, dated October 16, 1903, work to be commenced October 26, 1903; date of expiration, January 30, 1904. Price, 36 cents per cubic yard, place measurement.

With Atlantic Dredging Company, for dredging and building embankments, dam, highway bridge, railroad bridge, piers, and flume. This contract had not been approved by the Chief of Engineers, United States Army, at the close of the fiscal year. Prices: Section A, (*a*) 40 cents per cubic yard, measured in the cut; (*b*) 22 cents per cubic yard, measured in the cut; Section B, 40 cents per cubic yard, measured in the cut; Section C, (*a*) 50 cents per cubic yard, measured in the fill; (*b*) 18 cents per cubic yard, measured in the fill; Section D, 18 cents per cubic yard, measured in the cut; rock for dam, $1.70 per gross ton for large, $1.70 per gross ton for medium, $1.90 per gross ton for crushed stone; railroad bridge, piers, and abutments, for concrete, $10 per cubic yard, measured in place; for coping, $20 per square yard of horizontal area; for fill behind abutments, 40 cents per cubic yard, measured in the fill; highway bridge, $14,000; flume, $2.000; revetment, $1.50 per square yard.

COMMERCIAL STATISTICS.

The following statistics, relative to the commerce of the Appomattox River, Virginia, during the calendar year 1903, were compiled from statements furnished by shippers:

Articles.	Amount.	Value.
	Tons.	
Lumber	53,540	$267,003
Grain	319	12,789
Coal	1,730	10,720
Fertilizer	4,310	43,100
Railroad ties	6,318	24,964
Peanuts	6,311	65,025
General merchandise	31,100	622,000
Total	103,628	1,045,601

Vessels.

Class.	Number.	Average draft.	Average tonnage.
		Feet.	
Steam	861	8	75
Sail	114	9	100
Barges	207	9	300
Total	1,182		

L 7.

IMPROVEMENT OF HARBOR AT CAPE CHARLES CITY, VIRGINIA.

The work of dredging in progress at the close of the last fiscal year under the contract described below was continued until September 16, 1903. Under this contract a total of 58,840 cubic yards of material was removed, of which 53,677 cubic yards were excavated during the current fiscal year. This removal resulted in the dredging of the entrance channel to a depth of 16 feet over an area of 120 by 440 feet, and within the basin two shoals having less than 14 feet at mean low water were excavated to that depth, their dimensions being 100 by 520 and 120 by 250 feet. The price paid for this work was 32 cents per cubic yard, scow measurement. The project is considered to be about 70 per cent completed.

The amount recommended will be applied to dredging and jetty construction.

Money statement.

July 1, 1903, balance unexpended		$19,748.66
June 30, 1904, amount expended during fiscal year for works of improvement		19,747.13
July 1, 1904, balance unexpended		1.53
Amount (estimated) required for completion of existing project		67,340.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$40,000.00	
For maintenance of improvement	10,000.00	
		50,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

September 19, 1890	$25,000
July 13, 1892	10,000
March 3, 1899	20,000
June 13, 1902	20,000
Total	75,000

CONTRACT IN FORCE.

With McLean Contracting Company for dredging, dated May 4, 1903; approved May 27, 1903; work to be commenced July 20, 1903; date of expiration, September 16, 1903; price, 32 cents per cubic yard, scow measurement.

COMMERCIAL STATISTICS.

The following statement represents the commerce of the harbor at Cape Charles City, Va., during the calendar year 1903, and was prepared from statements supplied by lines and individuals handling the freight:

Articles.	Amount.	Value.
	Tons.	
Merchandise and produce	1,155,952	$11,559,520

Vessels.

Class.	Number.	Average draft.	Average tonnage.
		Feet.	
Steam	[a] 9	12	405
Barges	[a] 8	8	1,600

[a] Daily.

L 8.

IMPROVEMENT OF WATERWAY FROM NORFOLK, VIRGINIA, TO THE SOUNDS OF NORTH CAROLINA.

The only work done on this waterway during the fiscal year was performed by the U. S. snag boat *Roanoke* in the latter part of May and the first part of June, 1904, and consisted in the removal from the Pasquotank River, North Carolina, and Turners Cut, North Carolina, of 108 logs, from 10 to 16 feet long; 20 piles, 40 to 80 feet long; 33 stumps, 53 snags, and 4 trees. From Deep Creek, Virginia, 8 logs were removed.

This project is considered to be about completed, the work needed being solely for maintenance.

The funds available and the amount recommended will be applied toward any work of maintenance that may be found necessary.

Money statement.

July 1, 1903, balance unexpended	$3,673.54
June 30, 1904, amount expended during fiscal year, for works of improvement	1,186.73
July 1, 1904, balance unexpended	2,486.81
July 1, 1904, outstanding liabilities	146.11
July 1, 1904, balance available	2,340.70
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	5,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

March 3, 1899	$25,000
June 6, 1900	200,000
March 3, 1901	29,870
Total	254,870

COMMERCIAL STATISTICS.

The following statistics were compiled from a statement furnished by the Lake Drummond Canal and Water Company, and indicate the traffic through the Dismal Swamp Canal, Virginia and North Carolina, during the calendar year 1903.

Articles.	Amount.	Value.
Lumber ... feet B. M.	101,067,542	$1,313,878
Shingles ... number	4,474,400	22,372
Juniper logs ... cords	12,032	60,160
Gum logs ... do	448½	2,243
Split rails ... feet	2,632	39
Poles ... number	8,031	16,062
Wood ... cords	519	1,557
Pine piles ... linear feet	800,166	48,009
Mill logs ... feet B. M.	1,819,059	18,191
Cypress piles ... linear feet	4,070	204
Gum logs ... feet B. M.	1,092,500	10,925
Oak piles ... linear feet	2,470	247
Railroad ties ... number	1,161	580
Posts ... do	1,157	463
Spars ... do	2	20
Staves ... do	1,080	30
Skidder ... tons	20	10
Oysters ... bushels	4,000	2,000
Corn ... do	36,453	18,226
Shells ... do	15,600	624
Phosphate ... tons	16,988	339,760
Coal ... do	4,737	16,948
Engine	...	250
Iron safe	...	50
Machinery ... tons	60	12,000
Sand ... do	300	200
Hay ... do	38	608
Car wheels ... number	10	50
Boilers ... do	24	12,000
Iron ... tons	50	5,500
Potatoes ... barrels	1,647	3,294
Junk ... cords	15	75
Cotton ... bales	465	15,113
Salt ... tons	1,372	4,116
Stone ... do	72¼	36
Oats ... bushels	500	250
Iron rails ... tons	74	740
Miscellaneous ... do	58,980	707,760
Total	...	2,634,590

Vessels.

Class.	Number.	Average draft.	Average tonnage.
		Feet.	
Steamers	1,793	8	51
Barges	946	9	249
Schooners	1,070	7	51
Yachts	55	6	34
Lighters	648	5	
Rafts	[a] 53		
Launches	82		
Dredge	1		
Scows	7		
Pontons	2		
Pile driver	1		
House boats	2		

[a] Averaging 9,091 feet lumber, or 9,096 feet pine piles, or 28,261 feet mill logs each.

L 9.

IMPROVEMENT OF INLAND WATER ROUTE FROM NORFOLK, VIRGINIA, TO ALBEMARLE SOUND, NORTH CAROLINA, THROUGH CURRITUCK SOUND.

Dredging was commenced under the contract described below on January 11, 1904, at North River bar, and continued until April 27, 1904. The total number of cubic yards removed at the contract price, 42$\frac{9}{10}$ cents, was 34,072 cubic yards, scow measurement. This work resulted in the excavation of a channel through the bar at the mouth of North River, 70 feet wide and 10 feet deep at mean low water. The work done was in the nature of maintenance, the channel previously dredged having shoaled considerably.

The U. S. snag-boat *Roanoake* was employed on this route from June 6, 1904, to the close of the fiscal year, and up to that date had removed from North Landing river, 253 logs, from 16 to 24 feet long, 4 piles, from 30 to 70 feet long, 5 snags, and 4 stumps, and placed the same on the banks. From the southern branch of the Elizabeth River, Virginia, 2 logs and 1 pile were taken from the river bed and put out on the banks, when the snag-boat was en route from Norfolk to the North Landing River.

The project is considered to be about 95 per cent completed.

The funds available will be applied to the removal of sunken logs, and the amount recommended for work of improvement is for dredging such shoals as may be authorized.

Money statement.

July 1, 1903, balance unexpended		$20,113.00
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		17,173.68
July 1, 1904, balance unexpended		2,939.32
July 1, 1904, outstanding liabilities		265.87
July 1, 1904, balance available		2,673.45
Amount (estimated) required for completion of existing project		[a] 17,173.68
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$17,173.68	
For maintenance of improvement	5,000.00	
		22,173.68
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

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[a] Expended for maintenance in current fiscal year.

APPROPRIATIONS.

For Southern Branch Elizabeth River, Virginia:		
March 3, 1873	$15,000	
June 23, 1874	10,000	
March 3, 1875	5,000	
August 14, 1876	5,000	
June 18, 1878	5,000	
		$40,000.00
For North Landing River, Virginia and North Carolina:		
March 3, 1879	25,000	
June 14, 1880	15,000	
March 3, 1881	7,500	
August 2, 1882	8,000	
		55,500.00
For Currituck Sound, Coinjock Bay, and North River bar, North Carolina:		
June 18, 1878	20,000	
March 3, 1879	25,000	
June 14, 1880	25,000	
March 3, 1881	30,000	
August 2, 1882	20,000	
July 5, 1884	5,000	
August 5, 1886	10,000	
August 11, 1888	7,500	
		142,500.00
For inland water route, etc.:		
September 19, 1890	10,000	
July 13, 1892	9,000	
August 18, 1894	10,000	
June 3, 1896	10,000	
March 3, 1899	8,000	
June 13, 1902	23,400	
		70,400.00
Total		308,400.00
Amount received from sale of property to other works		2,169.69
Aggregate		310,569.69

CONTRACT IN FORCE.

With Norfolk Dredging Company, for dredging, dated December 30, 1903; approved January 9, 1904; work to be commenced January 23, 1904; date of expiration, April 27, 1904. Price, $42\frac{9}{10}$ cents per cubic yard, scow measurement.

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of the inland water route from Norfolk Harbor, Virginia, to Albemarle Sound, North Carolina, during the calendar year 1903, were compiled from statements furnished by the Albemarle and Chesapeake Canal Company and shippers along the route.

Articles.	Amount.	Value.
	Tons.	
Lumber, logs, shingles, etc	168,412	$680,580
Miscellaneous	35,400	796,500
Total	203,812	1,477,080

Vessels.

Class.	Number.	Average draft.	Average tonnage.
		Feet.	
Steam	1,996	7	45
Sail	473	7	31
Barges	669	7	200
Rafts	292		

L 10.

IMPROVEMENT OF EDENTON BAY, NORTH CAROLINA.

Under the contract with Mr. W. H. French, described below, 15,233 cubic yards of material, at the price of 29½ cents per cubic yard, place measurement, were removed between September 17, 1903, and December 9, 1903. The dredging was done at three localities in the harbor, the first being the cutting away of a point at the entrance to the inner harbor. This was cut back a distance of 120 feet. Beyond this point toward the wharves the channel was widened 100 feet, three parallel cuts being taken, the longest being 950 feet and the shortest 500 feet. Opposite the Norfolk and Southern wharf two cuts, 40 feet wide each and 500 feet long, were taken in widening the channel at that point. This project is now practically completed.

Money statement.

July 1, 1903, balance unexpended	$5,843.34
June 30, 1904, amount expended during fiscal year for works of improvement	5,622.71
July 1, 1904, balance unexpended	220.63

APPROPRIATIONS.

June 18, 1878	$4,000	June 13, 1902	6,000
March 3, 1879	1,000		
July 5, 1884	10,000	Total	23,000
August 5, 1886	2,000		

CONTRACT IN FORCE.

With W. H. French, for dredging, dated July 6, 1903; approved July 31, 1903; work to be commenced September 5, 1903; date of expiration, December 9, 1903. Price, 29½ cents per cubic yard, place measurement.

COMMERCIAL STATISTICS.

The following statistics relative to the commerce of Edenton Bay, North Carolina, during the calendar year 1903, were compiled from statements furnished by transportation lines handling the freight:

Articles.	Amount.	Value.
	Tons.	
Logs	15,000	$30,000
Lumber	25,000	125,000
Merchandise and produce	140,520	1,511,888
Total	180,520	1,666,888

L II.

IMPROVEMENT OF ROANOKE RIVER, NORTH CAROLINA.

No work was carried on on this stream during the fiscal year. The expenditures were for care and maintenance of the U. S. snagboat *Roanoke*, which was out of commission at Plymouth, N. C.

The project is considered to be about 80 per cent completed.

The available funds, with the amount recommended, will be applied to the removal of channel obstructions and the construction of a dam near Weldon, N. C.

Money statement.

July 1, 1903, balance unexpended	$6,591.16
June 30, 1904, amount expended during fiscal year, for works of improvement	764.53
July 1, 1904, balance unexpended	5,826.63
Amount (estimated) required for completion of existing project	41,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

March 3, 1871	$20,000
June 10, 1872	10,000
March 3, 1873	10,000
June 23, 1874	5,000
August 2, 1882	5,000
July 5, 1884	3,000
August 5, 1886	20,000
August 11, 1888	40,000
September 19, 1890	25,000
July 13, 1892	$50,000
August 18, 1894	30,000
June 3, 1896	10,000
Total	228,000
Amount received from sale of property to other works	1,338
Aggregate	229,338

COMMERCIAL STATISTICS.

The following statistics show the commerce of the Roanoke River, North Carolina, during the calendar year 1903, and were compiled from statements obtained from the shippers:

Articles.	Amount.	Value.
	Tons.	
Lumber	32,000	$160,000
Logs	27,376	55,000
Shingles	4,500	45,000
Merchandise and produce	51,299	649,490
Fish	700	33,000
Total	115,875	942,490

L 12.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

Wreck of schooner Willie Lee Hall.—The removal of this wreck was authorized April 17, 1903, at a cost not to exceed $400, which was provided for doing the work. The wreck was in 20 feet of water at mean low tide, off Newport News Point, and a local contractor submitted an offer to remove it for $98, which was accepted, and the work of demolishing it, which had been nearly completed in the preceding fiscal year, was finished early in the current fiscal year. The total cost of destroying the wreck was $130.35.

Wreck of schooner E. H. Weaver.—This vessel was wrecked at the entrance to Chesapeake Bay, and after its cargo of lumber had been removed by the owners, the hull was towed by wreckers to Willoughby Bank and there stripped and abandoned. Its removal was authorized October 19, 1903, at a cost of $400, which amount was provided for doing the work. The wreck was destroyed by explosives between November 1 and 9, 1903, at a cost of $200.

Wreck of barge John J. Ward.—This barge sank in the Pasquotank River, North Carolina, about one-half of a mile below the southern terminus of Turners Cut, North Carolina, and after its cargo of anthracite coal had been removed by wreckers it was abandoned. Its removal was authorized October 21, 1903, the sum of $500 being provided to cover the cost of the work. An offer of $325 was received from a local contractor for the removal of the wreck and it was accepted. The work was commenced on the destruction of the wreck by explosives in the latter part of November, 1903, and completed on December 15 of the same year. The total cost of removing this wreck was $368.23.

L 13.

PRELIMINARY EXAMINATION OF PERQUIMANS RIVER, NORTH CAROLINA, AT AND NEAR HERTFORD.

[Printed in House Doc. No. 302, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 24, 1903.

Sir: I have the honor to submit herewith for transmission to Congress a report, dated January 21, 1903, by Maj. James B. Quinn, Corps of Engineers, and a report supplementary thereto, dated September 23, 1903, with map,[a] by Capt. E. Eveleth Winslow, Corps of Engineers, on preliminary examination of Perquimans River, North Carolina, "at and near Hertford," made in accordance with the provisions of the river and harbor act approved June 13, 1902.

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[a] Not reprinted; printed in House Doc. No. 302, Fifty-eighth Congress, second session.

Captain Winslow presents a plan for securing, by dredging and the removal of existing stumps, a channel 200 feet wide and 9 feet deep at mean low water below Hertford, which is located 11 miles above the river's mouth, and of the same depth, with width of 60 feet between Hertford and Wards Landing, the latter being 11 miles above Hertford, at a total estimated cost of $12,500.

It is the opinion of the local and division engineers that the improvement of the stream to the extent outlined in this plan is worthy of being undertaken by the General Government. The Board of Engineers for Rivers and Harbors, which has reviewed these reports pursuant to the provisions of sections 3 and 14 of the aforementioned act, expresses the belief, however, that the words of the act, "at and near Hertford," confine the limit of any proposed improvement to the immediate vicinity of that town, and that the work contemplated by the law is the removal of the stumps and the shoal below the county bridge at Hertford. In the opinion of the Board, which is concurred in by me, it is desirable for the United States to undertake the improvement to the extent of providing below said bridge a channel 9 feet deep and 200 feet wide, at an estimated cost of $11,250.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF MAJ. JAMES B. QUINN, CORPS OF ENGINEERS.

Engineer Office, United States Army,
Norfolk, Va., January 21, 1903.

General: In compliance with instructions contained in letter from your office dated July 8, 1902, assigning to me the duty of making a preliminary examination of the "Perquimans River, at and near Hertford," in the State of North Carolina, ordered by the act of Congress, approved June 13, 1902, I have the honor to submit the following report:

An examination of this stream from its mouth to the town of Hertford, N. C., was made by Mr. S. T. Abert, United States civil engineer, on June 12, 1875, and a report submitted thereon dated December 14, 1875, will be found on page 361, Part 1, of the Annual Report of the Chief of Engineers for the fiscal year 1876.

In 1884 a preliminary examination of this stream above Hertford, N. C., was made by Capt. F. A. Hinman, Corps of Engineers, U. S. Army, and his report on that portion of the stream is to be found on pages 1045 and 1046, Part 2, of the Annual Report of the Chief of Engineers, for the fiscal year 1885.

No expression of opinion as to the worthiness of the stream for improvement was made by Mr. Abert in his report on the section below Hertford, but an estimate of the cost of the work was stated therein at $2,000. In Captain Hinman's report for the portion above Hertford, the stream was considered as unworthy of improvement. The physical characteristics of this river are fully described in the reports above referred to, and a reproduction of it is therefore considered unnecessary.

Upon the present call for a report upon the Perquimans River, it may be stated that the particular locality complained of covers an area estimated at 100,000 square feet, about a quarter of a mile below the county bridge, scattered over which there are numerous stumps of pine and cypress trees.

The lumber mills and boat landings of the town are all above this stumpy reach, and the depth of water from below it to the mouth of the river in Albermarle Sound, a distance of about 11 miles, is about 9 feet. The channel below Hertford is unobstructed, except at one point near the mouth, where a large stump in the center of the channel prevents its use by vessels drawing over 6 feet of water. The water of the river is fresh, and the oscillations of the water level are entirely due to the velocity and direction of the wind.

The commerce, as far as I am able to learn, is chiefly confined to the transportation of logs for the use of the mills in operation at Hertford, with probably a small amount of agricultural produce, shipped from the farms adjacent to the course of the stream, and which are brought down in boats to Hertford and shipped from there to northern points by rail. Although I have made an effort to secure complete statistics of the amount of shipments made by way of the river, I am unable to present more than what is contained in the above statements, owing to the failure of parties requested to make reply to my inquiries.

From a rough estimate, it is judged that the removal of the obstructions "at and near Hertford" would cost approximately $5,000, the expenditure of which does not seem to me to be justified by the present or prospective demands of commerce on the Perquimans River. I therefore consider that stream to be unworthy of improvement.

Respectfully submitted.

JAMES B. QUINN,
Major, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., January 29, 1903.

Respectfully submitted to the Chief of Engineers, United States Army. I concur in the views of the district engineer.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
February 5, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 31, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

At the time the within report was made the district officer had been unable to secure any definite commercial statistics. Since then the four communications[a] inclosed herewith have been received. Moreover the estimate of cost contained within is, as stated, a "rough estimate" only.

As the desirability of the proposed improvement depends upon its cost as compared with the commercial benefits to follow its execution, the Board recommends that these papers be returned to the district officer, and that he be instructed to extend the preliminary examination sufficiently to collect, by a survey or otherwise, the data necessary for the preparation of a project with estimate of cost, and to state in the light of this new estimate and of the commercial statistics herewith and of any other information he may be able to obtain, whether he concurs in the opinion of the former district officer as to the desirability of the contemplated improvement. A finished map of the obstruction complained of just below the town of Hertford is not desired, but the Board would be glad to have a sketch showing the relative position of this shoal to the channel and the town wharves.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 6, 1903.

Respectfully referred to Capt. E. E. Winslow, Corps of Engineers, inviting attention to the preceding indorsement by the Board of Engineers for Rivers and Harbors.

The recommendations of the Board are approved, and Captain Winslow is requested to submit a supplementary report giving the information desired.

Should an allotment of funds be necessary to carry out these instructions, a request therefor will have favorable consideration.

These papers to be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Ninth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, November 11, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors with further report as recommended.

By command of Brig. Gen. Gillespie:

W. V. JUDSON,
Captain, Corps of Engineers.

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[a] Not printed.

[Tenth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 10, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

In addition to the within report and the indorsement of the division engineer thereon, the Board of Engineers for Rivers and Harbors has considered the inclosed supplemental report of the district officer upon an extension of the preliminary examination of Perquimans River at or near Hertford, the indorsement of the division engineer upon the same, and several letters from interested persons.

Perquimans River, from its mouth to the town of Hertford, a distance of 11 miles, is an estuary of Albemarle Sound. Above Hertford it becomes narrower and has more of the characteristics of a river. It is navigable for boats drawing 7 feet as far up as Wards Landing, 11 miles above Hertford, where its width is about 80 feet. It appears that the principal obstructions to navigation are clusters of submerged stumps and the shoals formed thereby.

It is the desire of those interested to have the river improved to a depth of 9 feet, so as to accommodate vessels of that draft now using the canals between Norfolk and Albemarle Sound. To provide a channel of such depth would require dredging and stump pulling at a few localities only in the total distance. The district officer recommends a channel 9 feet deep and 200 feet wide below Hertford, and of the same depth and 60 feet wide between Hertford and Wards Landing, at a total estimated cost of $12,500. In this recommendation the division engineer concurs.

There is quite a large general commerce on Perquimans River. The principal tonnage is in lumber, and the principal item of value is cotton. The following is an approximate estimate of the business of 1902:

Peas	bags	225
Cotton	bales	3,000
Cotton seed	tons	1,250
Fish	packages	2,000
Poultry and eggs	do	400
Shingles	thousand	100
Peanuts	bags	5,000
Miscellaneous	packages	3,600
Potatoes	barrels	13,000
Guano	tons	1,500
General merchandise	do	1,000
Logs and lumber	do	30,000

About 36,000 tons, valued at $400,000.

The Board believes that the words of the act, "at and near Hertford," confine the limit of any proposed improvement to the immediate vicinity of that town, and that the work contemplated by the act is the removal of the stumps and the shoal below the county bridge. To this extent the Board believes the improvement of Perquimans River by the United States is justified by the present and prospective commerce involved.

In a communication replying to the Board's request for an estimate of the cost of a suitable channel below the county bridge, the district officer states that if the improvement is confined to this locality it will reduce his estimate not more than 10 per cent.

It appears therefore that the cost of an adequate improvement in this locality will amount to $11,250. The district officer submits no estimate for maintenance. It is believed that this item will be small and that no appropriation for this purpose will be required at least for several years.

In view of the small cost of the proposed improvement, its probable permanency if effected, and the character and extent of the commerce involved, the Board believes that it is desirable for the United States to undertake the improvement of Perquimans River to the extent of providing a channel 9 feet in depth and 200 feet in width below the county bridge at the town of Hertford, N. C., at an estimated cost of $11,250, and the Board so recommends.

For the Board:

Chas. J. Allen,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

SUPPLEMENTARY REPORT ON PRELIMINARY EXAMINATION.

Engineer Office, United States Army,
Norfolk, Va., September 23, 1903.

General: In compliance with instructions contained in paragraph 2 of the letter from your office dated August 18, 1903, notifying me of an allotment of $150 for the purpose of securing the additional data desired for the Board of Engineers for Rivers and Harbors in connection with the report upon the preliminary examination of the Perquimans River at and near Hertford, N. C., submitted by my predecessor January 21, 1903, under an item calling for the said examination in the act of June 13, 1902, I have the honor to submit the following:

A survey of the above-mentioned stream, between the Norfolk and Southern Railroad bridge above the town of Hertford and the stumpy reach below that place, was made under my direction August 13 to 15, 1903, and a tracing of the resulting map is submitted in a separate package.

It is apparently the desire of those interested that the Perquimans River be so improved as to permit its navigation by vessels of the same draft as those which can now pass through the two canal routes between Norfolk, Va., and Albemarle Sound, N. C., and a depth of 9 feet at mean low water would have to be secured in the river for that purpose.

At present the existing depth in the channel of Perquimans River allows the passage, at mean low water, of vessels drawing 7 feet, to within 500 feet of Wards Landing, which is about 11 miles above the county bridge at Hertford. To provide a low-water depth of 9 feet will require dredging and stump pulling at only a few localities between the mouth of the river and Wards Landing.

If a channel 100 feet wide is provided through the stumpy reach, beginning about 800 feet below the county bridge at Hertford, its axis following the deep water now existing in the said reach, the southern limit of this channel would be fringed with stumps, which would not improve, to any considerable extent, its now dangerous condition. It would, therefore, be prudent to make the width of this channel 200 feet, and its depth 9 feet at low water, which would include within its limits about all of the stumps that are now a menace to navigation, and give plenty of room for maneuvering boats so that they may be kept off of the few which would remain.

The river in the vicinity of the shoal near Wards Landing is only 80 feet in width, and the least depth is 6 feet at mean low water. A 60-foot channel would appear to be ample at this locality.

The statistics which have been filed since the report of January 21, 1903, was submitted indicate that the commerce on the river for 1902 amounted in value to approximately $300,000, and as I believe if this data had been at hand when the report above mentioned was prepared the recommendation as to the unworthiness would not have been made, I recommend the stream as worthy of improvement, to the extent of securing, by dredging and the removal of the existing stumps, a channel 200 feet wide, and 9 feet deep at mean low water, through the stumpy reach just below the county bridge at Hertford, and a channel 60 feet wide, to the same depth, through the shoal in the vicinity of Wards Landing, together with the removal of any stumps in the channel of the river between these points which may be an obstruction to navigation. The estimated cost of this work is as follows:

Dredging 21,000 cubic yards of material, at 50 cents	$10,500
Removing 60 stumps, at $10 each	600
Contingencies	1,400
Total	12,500

In explanation of the high price for dredging, I would say that the location where the work is contemplated in this stream is isolated, and it is hardly probable that a contract could be made to do the work for any less, as the cost of placing the plant on the ground would be considerable in proportion to the quantity of work to be done, and the roots of the numerous stumps would hamper the dredge to such an extent that it could not be worked to its full capacity.

Very respectfully, your obedient servant,

E. EVELETH WINSLOW,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE OF DIVISION ENGINEER, SOUTHEAST DIVISION,
Savannah, Ga., October 2, 1903.

Respectfully submitted to the Chief of Engineers, United States Army. The improvement, to the extent indicated, is concurred in.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

L 14.

REPORT OF A BOARD OF ENGINEERS ON PRELIMINARY EXAMINATION AND SURVEY FOR WATERWAY FROM NORFOLK, VA., TO BEAUFORT INLET, NORTH CAROLINA.

[Printed in House Doc. No. 563, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, February 18, 1904.

Sir: I have the honor to submit herewith, for transmission to Congress, reports by a Board of Engineers, dated September 22, 1902, and August 31, 1903, upon examination and survey, respectively, for waterway of 16-foot depth from Norfolk, Va., to Beaufort Inlet, North Carolina, provided for by the river and harbor act approved June 13, 1902, as follows:

> Waterway from Norfolk, Virginia, to Beaufort Inlet, North Carolina, with a view to the construction of a channel not less than sixteen feet in depth, upon the most advantageous route between the points named: *Provided*, That the examination and survey shall be made by a board of engineer officers detailed by the Secretary of War, and any report made shall include the probable cost of any private waterway that it may be to the interest of the United States to acquire in connection with the proposed improvement: *Provided further*, That the total expense of the examination and of any survey which may be made shall not exceed the sum of five thousand dollars.

The Board of Engineers, as originally constituted by detail of the Secretary of War under this authority of law, consisted of Col. Peter C. Hains, Lieut. Col. Charles J. Allen, and Maj. James B. Quinn, of the Corps of Engineers. Upon the promotion of Colonel Hains to the rank of brigadier-general, the vacancy on this Board was filled by the appointment of Capt. E. Eveleth Winslow, Corps of Engineers, in charge of river and harbor works in the vicinity of Norfolk.

Owing to the nature of the country, and on account of various works of improvement heretofore carried on by the General Government and private parties, there were numerous alternative locations subject to consideration by the Board in selecting the "most advantageous route between the points named," as required by the law.

As a result of its investigations the routes selected by the Board in the different divisions of the waterway are as follows: Via Cooper Creek, Rose Bay, Adams Creek, and Beaufort Inlet, covering a total distance of 194.1 miles between Norfolk, Va., and Beaufort Inlet. The amount ($5,000) allotted by the act for this examination and survey was not sufficient to permit of a definite location of the exact lines of the proposed channel way. The Board specifically states that the selected route has been defined in general terms only, and that before the definite location of the different parts of the route can be made further detailed surveys will be necessary.

The estimated cost of a 16-foot channel by the route indicated is fixed by the Board at $10,000,000 in round numbers, with $150,000 annually for maintenance of the completed waterway. This estimate of first cost includes excavation, retaining walls, right of way, bridges, and one tidal lock, but does not include the purchase price of any canal rights, for the reason that the route selected does not follow the line of any existing private canal.

In concluding its report of August 31, 1903, the Board expresses the opinion that the selected route is a perfectly practicable one, and that a waterway can be constructed along it for the amount of the estimate named—$10,000,000—provided the appropriations are of sufficient size and are made with sufficient regularity to allow the work to be carried on constantly and systematically. After carefully considering all available data as to its present and prospective commerce, the Board gives the further opinion that the estimated cost of the project under discussion is not out of proportion to the extent of such commerce, added to the importance of the completed waterway as a factor in the scheme for coast defense on the Atlantic seaboard.

These reports have been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and attention is invited to this Board's report[a] of February 9, 1904, herewith. After reviewing at length the reports of the special Board, the Board of Engineers for Rivers and Harbors expresses the opinion that it is not now advisable to undertake the construction of a waterway from Norfolk to Beaufort Inlet with a channel not less than 16 feet in depth. The Board believes that a channel of less than 16 feet depth would be of great advantage to the commercial traffic and military interests involved, and recommends that a new inquiry be initiated by Congress with a view to ascertaining the best route, and the cost of channels 10 and 12 feet deep, respectively, and of suitable width, between Norfolk, Va., and Beaufort, N. C., with a view to determining the advisability of undertaking the creation of a channel of either of the depths mentioned.

I concur in the view of the Board of Engineers for Rivers and Harbors that it is not advisable for the United States to expend $10,000,000 in constructing a channel 16 feet deep from Norfolk, Va., to Beaufort Inlet, North Carolina.

Very respectfully, your obedient servant,

A. MACKENZIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. WM. H. TAFT,
Secretary of War.

REPORT OF BOARD OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,
Norfolk, Va., September 22, 1902.

GENERAL: The Board of Engineers, constituted by paragraph 1, Special Orders, No. 19, Headquarters, Corps of Engineers, United States Army, Washington, D. C., July 5, 1902, has the honor to submit the following report of the preliminary examination of the waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

The order constituting the Board is as follows:

SPECIAL ORDERS, No. 19.

HEADQUARTERS, CORPS OF ENGINEERS,
UNITED STATES ARMY,
Washington, July 5, 1902.

[Extract.]

1. By authority of the Secretary of War, and in accordance with the provisions of the river and harbor act of June 13, 1902, a Board of officers of the Corps of Engineers, to consist of Col. Peter C. Hains, Lieut. Col. Charles J. Allen, Maj. James B. Quinn, will assemble at Norfolk, Va., upon the call of the senior member, to make an examination and survey of the waterway from Norfolk, Va., to Beaufort Inlet,

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[a] Printed on page 1465, herewith.

North Carolina, with a view to the construction of a channel not less than 16 feet in depth, upon the most advantageous route between the points named, and to submit a report thereon, which report shall include the probable cost of any private waterway that it may be to the interest of the United States to acquire in connection with the proposed improvement.

The Board is authorized to visit such points as it deems necessary for the proper performance of its duties.

* * * * * * *

By command of Brig. Gen. Gillespie:

Chas. S. Bromwell,
Captain, Corps of Engineers.

The act of Congress providing for the examination and survey reads as follows:

Waterway from Norfolk, Virginia, to Beaufort Inlet, North Carolina, with a view to the construction of a channel not less than sixteen feet in depth, upon the most advantageous route between the points named: *Provided,* That the examination and survey shall be made by a board of engineer officers detailed by the Secretary of War, and any report made shall include the probable cost of any private waterway that it may be to the interest of the United States to acquire in connection with the proposed improvement: *Provided further,* That the total expense of the examination and of any survey which may be made shall not exceed the sum of five thousand dollars.

In pursuance of the foregoing order the Board met at Norfolk, Va., on August 1, 1902, and subsequently on September 16 and 17, 1902. At the second meeting representatives of the board of trade of Norfolk, and other persons interested, appeared before the Board and presented their views as to the advisability of the improvement. The question of an inland waterway from Norfolk, Va., to the sounds of North Carolina has been advocated for a number of years. About two years ago a report on a preliminary examination and survey was made to Congress with a view to obtaining a navigable depth of 16 feet at mean low water. The survey, however, extended only from South Mills, N. C., the southern terminus of the Dismal Swamp Canal, to the sea at Beaufort, N. C. The route was fixed by law via Core Sound, leaving no discretion in the selection of a better route should one be found to exist.

The law under which this Board is acting contemplates an examination of the most advantageous route between Norfolk, Va., and Beaufort Inlet, North Carolina. The total length of this route is about 200 miles. It will vary slightly, however, depending upon the particular line adopted. The route passes from Norfolk up the Southern Branch of the Elizabeth River, taking advantage of this stream as far as practicable; thence to Albemarle Sound, either by the Albemarle and Chesapeake Canal, the Dismal Swamp Canal, both of which have been constructed by private corporations, or by some other line to be determined after examination. From Albemarle Sound the route is via Croatan Sound, Pamlico Sound to Core Sound, and through it or to a point on the Neuse River, and through a short canal to Beaufort Harbor.

Although the Board has at its disposal the results of several previous surveys, there is still lacking much necessary information to enable it to determine the most advantageous route. To supply this necessary information a survey will be required.

As the cost of the proposed waterway might be dependent, possibly, upon the acquisition of one of the existing canals by the United States, letters were addressed to the presidents of those canal corporations with a view to obtaining information regarding the prices at which the canal properties could be acquired by the Government. As a meeting of the stockholders was necessary in each case to determine the selling price, this information could not be obtained in time for incorporation in this report. It will be sent later.

Each of the existing canals between Norfolk and Albemarle Sound has a depth of only 8 feet; consequently, the commerce availing itself of these water routes is limited to such as can be economically transported in vessels of this draft. At present this commerce amounts to a little over 400,000 tons per annum, valued at about $4,000,000, upon which is levied no less than $100,000 as canal tolls. When one takes into consideration that the canals are narrow, the approaches tortuous, and the depth only available to small vessels, it is readily seen that the commercial statistics of the existing trade would form no basis for an opinion as to what might be developed by a deeper, more commodious, and free canal. It is reasonable to infer that much of that commerce which is obliged to take the outside route, for the reason that it could not be transported through the canals upon the present available depth of water, would undoubtedly seek the inside route, provided the navigable depths were satisfactory.

The records of the Life-Saving Service show that within the last twenty-five years not less than $3,000,000 worth of property and 67 lives have been lost on the shoals in the vicinity of Cape Hatteras alone. The records of the losses in the vicinity of Cape Lookout are not immediately available, but the losses are no doubt sufficient to add materially to the aggregate for the two capes, and argue strongly for the existence of a safer route, under existing conditions.

The character and volume of commerce passing any course is largely determined by the nature and the facilities offered by the route followed. In the case under consideration the dangers of the outside navigation have placed a limit to the quantity of commodities which can be shipped by that route, and the character of the navigation which the canals afford has placed a limit upon the quantity of freight which can be carried through them. Evidently the commerce through the canals at present would not justify an expenditure of something like $7,000,000 for its benefit, but the experience gained in similar cases shows that a very great improvement in the volume of commerce over a favorably disposed water route follows upon the improvement of that route, and it is reasonably certain that if a satisfactory inland water route from Norfolk, Va., to Beaufort Inlet, North Carolina, were constructed not only would a large portion of the commerce which now hazards the outside course be diverted to this route, but the increased facilities afforded by the inland route would develop better methods of transportation and attract a large volume of commerce which at present seeks other channels.

It has been demonstrated that the cheapest method of transporting bulky freight is by means of barges towed by suitable tugs. Previous to the introduction of this method it cost from $3 to $5 per ton to ship coal from Norfolk to New York and Boston; now the freight rate is from 75 cents to $1.50 per ton, it having been found possible to employ barges northward, owing to the existence of numerous harbors between Norfolk and New York. Southward of the Chesapeake Bay there is not a harbor until Beaufort Inlet is reached, and the risks involved in going such a long distance without any intermediate places of refuge have, so far, prevented the introduction of this method of transportation.

An inland water route would lend itself admirably to the method of barge transportation, and the consequent lowering of freight rates would have a very great influence in developing a traffic that at present does not exist.

What advantages would accrue to commerce by the construction of the proposed water route is, in a great measure, speculative. It would offer a safe route for barges from Baltimore to the mouth of St. Johns River, Florida, and possibly to Cuba and other West India islands. It would enable coal, machinery, and manufactured articles to be shipped south, and lumber, cotton, phosphate, and southern products to be shipped north by the most economical method known. According to Captain Lucas's estimate, based upon an extended investigation of this subject and contained in his report of November 22, 1900, the commerce of this route would amount to as much as $115,000,000 per annum.

The possession of such an inland route would be important from a military point of view, and there are not a few who do not hesitate to say that the importance of this feature alone is sufficient to warrant the expenditure of whatever sum that may be necessary to secure its construction.

After due consideration the Board is of the opinion that the proposed inland waterway can be secured for a sum not exceeding $7,000,000, that it is entirely feasible, and that the improvement is worthy.

There are several routes which are possible, and to determine the best of these a survey is necessary. The cost of such a survey is limited by the terms of the law to $5,000. This amount is hardly sufficient to admit of desirable precision, but will permit such examination as to enable the Board to determine the most advantageous route.

The Board therefore recommends that an allotment of $5,000 be made for the contemplated survey.

Respectfully submitted.

Peter C. Hains,
Colonel, Corps of Engineers, President.
Chas. J. Allen,
Lieut. Col., Corps of Engineers.
James B. Quinn,
Major, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

[First indorsement.]

Office Chief of Engineers, U. S. Army,
October 1, 1902.

Respectfully submitted to the Secretary of War.

The river and harbor act of June 13, 1902, provided for a preliminary examination as follows:

> Waterway from Norfolk, Virginia, to Beaufort Inlet, North Carolina, with a view to the construction of a channel not less than sixteen feet in depth, upon the most advantageous route between the points named: *Provided*, That the examination and survey shall be made by a board of engineer officers detailed by the Secretary of War, and any report made shall include the probable cost of any private waterway that it may be to the interests of the United States to acquire in connection with the proposed improvement: *Provided further*, That the total expense of the examination and of any survey which may be made shall not exceed the sum of five thousand dollars.

In accordance with this item a preliminary examination was assigned to a Board consisting of Col. Peter C. Hains, Lieut. Col. Charles J. Allen, and Maj. James B. Quinn, all of the Corps of Engineers.

The Board, as the result of the examination, submits the within report, finding the project worthy and feasible. A survey is necessary to enable the Board to determine which of the different routes is the best, since no suitable survey exists over a part of the distance. For reasons of economy it is desirable that the survey be made with the least practicable delay.

To this end I recommend that it be ordered at once.

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

[Second indorsement.]

War Department,
October 2, 1902.

Approved.

E. Root,
Secretary of War.

[Third indorsement.]

Office Chief of Engineers, U. S. Army,
September 19, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

H. F. Hodges,
Major, Corps of Engineers.

[Fourth indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., February 9, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

Having reviewed the within report of a Board of Engineers on an examination and survey of a proposed "waterway from Norfolk, Virginia, to Beaufort Inlet, North Carolina, with a view to the construction of a channel not less than sixteen feet in depth," and having considered all available data bearing upon this subject, the Board of Engineers for Rivers and Harbors respectfully invites attention to its accompanying report[a] of this date.

For the Board:

A. M. Miller,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

REPORT OF A BOARD OF ENGINEERS ON SURVEY FOR WATERWAY FROM NORFOLK, VA., TO BEAUFORT INLET, NORTH CAROLINA.

Engineer Office, United States Army,
Norfolk, Va., August 31, 1903.

General: The Board of Engineers constituted by paragraph 1, Special Orders, No. 19, Headquarters, Corps of Engineers, United States Army, Washington, D. C., July 5, 1902, has the honor to submit the following report upon a survey of the waterway from Norfolk, Va., to Beaufort Inlet, North Carolina. This report is submitted in compliance with the Department's letter of October 3, 1902, and is supplementary to the report upon a preliminary examination of the same route submitted by the Board under date of September 22, 1902.

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[a] Printed at page 1465, herewith.

Since the submission of the report just mentioned the personnel of the Board has undergone a change, Col. Peter C. Hains, Corps of Engineers, having been relieved from duty on the Board, owing to his promotion to the rank of brigadier-general, and the vacancy thus created being filled by the detail as a member of the Board of Capt. E. Eveleth Winslow, Corps of Engineers.

The distance from Norfolk to Beaufort via any of the possible lines for the waterway is approximately 200 miles. A large portion of the area to be considered consists of rivers and sounds already accurately surveyed and mapped by the Coast Survey or Engineer Department. Large portions of the land area have been covered by previous investigations, and consequently all that was necessary at this time was to make surveys of a few sections not previously covered and to make other investigations relative to the comparative feasibility of the different possible routes. This was rendered comparatively easy by the fact that the land throughout the area to be considered is very low and flat, and consequently a survey of one line will, as far as concerns quantities and estimates, do fairly well for other lines parallel and not far distant. Under the circumstances, therefore, the Board considers that it has obtained sufficient data to enable it to reach a proper decision as to the merits of the different possible routes, each route being considered in general terms only, the exact location of the different parts of the selected route to be made only after additional detailed surveys shall have been made. These will not be necessary unless Congress shall authorize the construction of the waterway.

The route of this waterway is through the southeastern part of Virginia and the eastern part of North Carolina, a territory a large part of the area of which is taken up by various sounds, rivers, creeks, and other bodies of water; consequently it is but natural that the utilization by commerce of these bodies of water and their connection by canals should have been frequently considered.

As early as 1787 an act was passed by the Virginia legislature authorizing the construction of what afterwards became the Dismal Swamp Canal. The construction of the canal proceeded under difficulties and it was more than thirty years before it was completed. As constructed this canal was passable for boats of small size only, and to overcome this difficulty the construction was begun in 1856 of a new and competing route now known as the Albemarle and Chesapeake Canal.

The first interest shown in the matter by the General Government was in 1837. In this year Congress authorized a survey from the southern end of the Dismal Swamp Canal southward to Winyah Bay, South Carolina. Again in 1875 another survey was ordered by Congress, this time of a route for a canal covering generally the same territory as at present under consideration and extending still farther south to the Cape Fear River. This work was performed by Mr. S. T. Abert, United States civil engineer, and his long and exhaustive report was published in the Report of the Chief of Engineers for 1876, pages

376 et seq. This report contains a good general description of the country to be traversed by this waterway. Another survey and examination was authorized in 1878 "of all the water lines and routes leading * * * from the harbor of Norfolk, Va., to the Atlantic Ocean, south of Hatteras." This survey was made under the direction of Capt. C. B. Phillips, Corps of Engineers, and his report was published in the Report of the Chief of Engineers for 1880, page 851 et seq.

In 1894 Congress directed "the survey of the waterways through the sounds of North Carolina, and * * * of the Dismal Swamp Canal, Virgina, and North Carolina * * * and * * * of the rivers and water connections connecting said canal with the sounds of North Carolina." The report on this survey was published in the Report of the Chief of Engineers for 1896, page 1086 et seq. Again in 1900 another examination and survey was ordered, this time from the southern end of the Dismal Swamp Canal to Beaufort Inlet, through a route specified in the act to pass via Croatan, Pamlico, and Core sounds. The report on this survey was published in the Report of the Chief of Engineers for 1901, page 1517 et seq. In addition to the above, Congress has at various times directed examinations of different localities which form links in one or more of the possible routes for this waterway.

DESCRIPTION OF TERRITORY TO BE TRAVERSED BY THE WATERWAY.

The region between Norfolk and Beaufort Inlet, through which the proposed waterway will have to pass, is generally low, rarely attaining an elevation above the sea level of over 20 feet. A large portion of its area is occupied by the "sounds" and their tributaries, and much of the remainder consists of marshes or wooded swamps at or but slightly above sea level.

The most noticeable features of its topography are, first, the narrow cordon of long, low, sandy islands separating the sounds from the ocean; and, second, the two large sounds known as Albemarle and Pamlico. The inlets between the islands that form the barrier between the sounds and the ocean, especially those along Pamlico Sound, are generally exceedingly changeable in character, new ones being frequently opened and the old ones closing up, while the channels through the more permanent ones are frequently shifting. Albemarle Sound is a large body of fresh and muddy water. It extends in a nearly east and west direction and across any probable route for the waterway. Pamlico Sound is a large body of salty water parallel to the coast and separated from the ocean by the line of sandy islands. Through or across it also pass all possible routes for the waterway.

The existence of the two large sounds in the path of this waterway divide it naturally into divisions which will be separately discussed:

First. The part from Norfolk Harbor to Albemarle Sound.
Second. From Albemarle Sound to Pamlico Sound.
Third. From Pamlico Sound to Beaufort Inlet.
Fourth. Beaufort Inlet.

FIRST DIVISION—NORFOLK TO ALBEMARLE SOUND.

The routes described in this section will all be considered to start at Norfolk Harbor opposite the foot of Main street, and will for convenience be supposed to end at a "common point" in deep water in the eastern part of Albemarle Sound about 6 miles southeast of Wade Point light, as all possible routes must pass through or near this point. Between these two points there exist at present two navigable routes, the one via the Dismal Swamp Canal, and that via the Albemarle and Chesapeake Canal. The waterway may therefore follow either of these or some alternative route.

Dismal Swamp Canal route.—This route passes by the South Branch of Elizabeth River, Deep Creek, Dismal Swamp Canal, Turners Cut, and the Pasquotank River, reaching the 17-foot curve in Albemarle Sound about 2 miles from the Wade Point light-house. At present this route affords passage for vessels of 9 feet draft and 39 feet wide.

The canal is owned and controlled by a private corporation, the Lake Drummond Canal and Water Company, but the United States has expended, approximately, $250,000 in excavating Turners Cut, and improving the channels in Deep Creek and Pasquotank River.

Elizabeth River.—The portion of this river included in this route is about 6½ miles long. Its average width is about 800 feet and its channel depth from 10 to 25 feet, except from the navy-yard downstream, where it has been dredged to 28 feet at mean low water. In its present condition it is too crooked, and considerable excavation will be necessary, both in deepening the channel and cutting through bends.

Deep Creek.—This creek, from its mouth in Elizabeth River to the canal lock, is a tidal stream about 3 miles long. It is very crooked and has low marshy banks except in a few places. A channel following the windings of the creek has recently been dredged by the United States from 75 to 100 feet wide, and deep enough to permit the passage of craft drawing 9 feet of water. In constructing the waterway a new channel would have to be dug cutting through the bends in several places, thus shortening the creek somewhat.

Dismal Swamp Canal.—This is a single-level canal and extends from the lock at Deep Creek to that at South Mills, a distance of about 22 miles. The surface of the water in the canal is maintained usually at an elevation about 12 feet above mean low water in the Elizabeth River. It is fed from Lake Drummond, about 3.5 miles distant, and with a water level about 10 feet above the surface of the canal. The locks are of timber with concrete gate anchorages, the chambers being 250 feet long and a few inches over 39 feet wide.

This canal, throughout its whole extent, passes through what was originally the Dismal Swamp, but from which large tracts have been reclaimed by drainage. It is not located on the shortest line between its termini nor along the line of the lowest profile. Originally it was probably a shallow ditch for floating timber, and has been developed, first, into a shallow canal with four levels, and finally through a number of changes to it present condition.

Only a small portion of the banks of the canal has been revetted, and as the excavated material has been placed right on the edge of the banks it is constantly sliding back into the canal, and a dredge is continually employed in removing it and at the same time increasing the cross section of the canal.

From South Mills for about seven-eighths of a mile below the lock the existing channel was excavated by the canal company and belongs to it. It has about the same available depth as the canal, but is not so wide.

Turners Cut.—This is an artificial channel cutting off a tortuous portion of the Pasquotank River, called the "Moccasin Track." Before the recent improvement of this route the available depth in this cut was not more than 2 feet and its width was from 45 to 60 feet. This condition was improved by the canal company excavating through the center of the cut a channel 40 feet wide and 10 feet deep. Early in the spring of 1902 the widening of the cut to from 85 to 100 feet at the water surface was completed under appropriations made by Congress, the excavation being carried to a depth of 10 feet at the normal stage. Turners Cut passes for its whole length through a swamp, is about 3⅓ miles long, and its banks are revetted for about one-third of its length.

Pasquotank River.—This river from the end of Turners Cut really consists of two very different sections; the upper, or river proper, extending to Cobb Point, 1 mile below Elizabeth City, while the lower is really an arm of Albemarle Sound. In the upper section, 11 miles long, the river is somewhat crooked and not very wide, and passes between banks generally swampy and thickly wooded. The channel varies in depth from 10 to 20 feet. It is sinuous, and a good deal of straightening will be necessary. The lower section of the river is quite different. It is broad and not very deep. Its width varies from 1 mile at Cobb Point to about 3 miles near the mouth. Its bottom is generally flat and from 10 to 13 feet deep in mid-channel. A shoal 6 miles long makes out from Wade Point and passes nearly across the mouth of the river. Around the end of this shoal there is an existing channel 12 feet deep, but it is probable that the best line for the new waterway would pass across the shoal. The distance measured this way from Cobb Point to the 17-foot contour in Albemarle Sound is 15½ miles.

The length of the improved Dismal Swamp route is:

	Miles.
In Elizabeth River	6.5
In Deep Creek	2.8
In the canal proper	22.2
In extension	.9
In Turners Cut	3.4
In upper Pasquotank	11.3
In lower Pasquotank to deep water	15.5
In Albemarle Sound	5.0
Total	67.6

Albemarle and Chesapeake Canal route.—This route is via South Branch of Elizabeth River, Albemarle and Chesapeake Canal (Virginia Cut), North Landing River, Currituck Sound, Coanjock Bay, Albemarle and Chesapeake Canal (Carolina Cut), and North River to Albemarle Sound.

The Albemarle and Chesapeake Canal is owned by a private corporation. It consists of two parts, the Virginia Cut, about 9 miles long, and the North Carolina Cut, about 3 miles long. This canal is a "sea-level" canal, the only lock being situated at the Elizabeth River end to overcome tidal differences. The lockage is sometimes up and sometimes down, and there is usually a short period of time in each six hours when all gates can be left open. This period is utilized especially for the passage of timber rafts. The lock is 220 feet long in the clear and 40 feet wide. The approaches to this canal and the waterways connecting its two parts have been improved and are maintained by the United States. About $300,000 have been expended in this way. At present the route is available for vessels of 9-foot draft.

Elizabeth River.—The part of this river included in this route is about 12 miles long, the entrance to the Albemarle and Chesapeake Canal being 5 miles above the mouth of Deep Creek. This part of the river has numerous shoals and is more crooked than the part below Deep Creek. Its average width is 250 feet, its depth varies from 8 to 15 feet. If adopted as the route for the canal, much straightening will be necessary.

Virginia Cut.—This passes for nearly its whole length through a thickly wooded swamp very slightly above the sea level, but near the Elizabeth River end there is a short length of cultivated land having a maximum elevation of about 9 feet above mean low water. The water level in the canal is ordinarily about 3 feet above low water in the Elizabeth River. The excavated material has been placed on the immediate banks, which are protected in places by sheet piling.

North Landing River.—The part of this river used in this route begins at the end of the Albemarle and Chesapeake Canal and extends to the end of Faraby Island, the head of Currituck Sound, a distance at present of 17 miles. At the end of the canal this river is narrow, but it gradually widens out, attaining a width of perhaps one-fourth of a mile 12 miles from its head. From this point the widening is quite rapid, a width of 1½ miles being attained at its mouth. The banks are low and swampy, and for some 8 miles are thickly wooded, but lower down the woods recede from the immediate banks, the borders of the river becoming wide marshes. Though crooked, the river pursues a fairly straight general course, and it would not be difficult, by cutting off points and across necks, to secure a channel with but slight curvature. Its bottom is generally mud and easily dredgeable.

Currituck Sound.—The portion of the sound through which the canal passes is about 10 miles long. It is broad and shallow, the normal depth being about 7 feet. A channel started a number of years ago by the canal company has been redredged and maintained by the United States to a depth of 9 feet and a width of 60 feet. Along this channel beacons have been established by the Light-House Department. The bottom is sandy and the dredging easy, but the maintenance of a channel of a cross section desired for the new waterway will probably require frequent redredging.

Coanjock Bay.—This is an arm of Currituck Sound, and through a marsh bordering on this bay a cut has been dredged. This cut was originally made by the canal company, but it is now maintained by the United States. Its length is 2¾ miles and its depth about 9½ feet.

North Carolina Cut.—This part of the canal passes for nearly its whole extent through ground, solid but of slight elevation. It is 2.8 miles long and passable for vessels of 9 feet draft.

North River.—This river, like the Pasquotank, really consists of two sections. The upper is narrow, deep, and crooked, with swampy or marshy banks. Its length is nearly 5 miles, but it can be considerably shortened by cutting through bends. The lower section of this river is wide, shallow, and straight. The channel from the beacon at the head of this section to the bar at North River is about 6⅝ miles long and 10 feet deep, with a muddy bottom. The bar at the mouth of the river had a natural depth of about 6 feet, but it has been dredged to about 9 feet by the United States. Considerable difficulty has been experienced in maintaining this channel. From the bar buoy inside to the 10-foot curve outside is about 1¾ miles, and to the 17-foot curve is about 1¼ miles farther.

The length of this route is:

	Miles.
Elizabeth River	11.7
Virginia Cut	8.5
North Landing River	14.5
Currituck Sound	10.4
Coanjock Bay	2.7
North Carolina Cut	2.8
Upper North River	4.9
Lower North River to deep water	9.4
In Albemarle Sound	3.7
Total	68.6

Alternative routes.—There are several alternative routes in this section, all taking advantage of one or more of the various streams existing in the locality.

Cooper Creek route.—This route leaves the South Branch of Elizabeth River about 1½ miles above the mouth of Deep Creek and extends in a direct line to the mouth of Cooper Creek, a tributary of the Pasquotank, and thence by way of that river as in the Dismal Swamp route above described. It passes through the lower portion of the old Dismal Swamp. It attains an elevation of about 20 feet 8 miles from the Elizabeth River, then decreases to about 1 foot at the crossing of the Northwest River, rises again to 22 feet, and then decreases again to its junction with Cooper Creek. This route proceeds by the shortest line from Elizabeth River to Albemarle Sound, and avoids the most tortuous portions of both the Elizabeth and Pasquotank rivers. This route is 62 miles long, 5.6 miles shorter than the Dismal Swamp route.

Northwest River route.—This route leaves the Elizabeth River at the same point as the Cooper Creek route, and follows a straight line to Northwest River, near the Norfolk and Southern Railroad bridge, and thence by Northwest River to its mouth in Currituck Sound, near the mouth of North Landing River, and thence by the remainder of the Albemarle and Chesapeake Canal route. From the Elizabeth River to Northwest River, the line passes through the same character of country as the Cooper Creek route. The part of Northwest River included in this route is comparatively straight and bordered by wide marshes so that a low profile can be obtained. This route is several miles longer than that by Cooper Creek, and compared with it has several disadvantages and no advantages. It is a more expensive route and will not be further considered.

Blackwater route.—This route leaves Elizabeth River near the head of the Albemarle and Chesapeake Canal, and proceeds in a straight line to a point in Blackwater Creek, near the Blackwater bridge, thence down the creek to its mouth in North Landing River. This route passes for nearly its whole length through a farming section with a maximum elevation of 28 feet. The length of this route is 64.3 miles, 4.3 miles shorter than that by the Albemarle and Chesapeake Canal.

SECOND DIVISION—ALBEMARLE SOUND TO PAMLICO SOUND.

All routes in this division will be supposed, for ease in comparison, to begin at the "common point" in the Albemarle Sound and to end at a "common point" in deep water in Pamlico Sound, about 2 miles east of Brant Island light, near or through which point all possible routes pass. Between these two points there is at present but one navigable waterway, that by Croatan Sound.

Croatan Sound route.—This route passes through Croatan Sound and thence along the axis of Pamlico Sound. Croatan Sound connects Albemarle Sound with Pamlico Sound and lies between Roanoke Island and the mainland, which are at an average distance apart of about 3 miles. Its bottom is very irregular, deep pockets and shoals being scattered in confusion; depths as great as 6 fathoms exist not far distant from shoals with less than 6 feet. The general depth is about 10 feet, but there is no continuous channel with a greater depth than 9 feet.

From Croatan Sound proper, in either direction to Albemarle or Pamlico sound, the water is shoal for a long distance, so that if this route be chosen dredging must begin within about 2 miles of the "common point" in Albemarle Sound and continue to below Long Shoal Point, a distance of about 41 miles. All of this dredging will be in a very exposed position and the dredged cut will be subject to rapidly fluctuating currents, and it is believed its maintenance will not be easy. Some years ago dredging was done in this sound near Croatan light; the cut was made 200 feet wide and 12 feet deep, and shoaled rapidly.

From Long Shoal Point the rest of the route will be in deep water except where it crosses Bluff shoal. This shoal is a very long, narrow reef of sand, running from the end of the left bank of Pamlico River directly across Pamlico Sound to the middle ground at Ocracoke Inlet. It is about 14 miles long, and on its crest the general depth is about 10 feet. At the point selected for the crossing of this route the least depth is about 11 feet, the width between 12-foot contours being about three-fourths of a mile and between 17-foot contours about 2 miles. It is probable that a cut through this shoal must be redredged from time to time.

The length by this route is—

	Miles.
Deep water, Albemarle Sound	2.2
Shoal water, Croatan Sound	41.0
Deep water, Pamlico Sound	30.5
Bluff shoal	2.0
Bluff shoal to "common point" near Brant Island light	10.7
Total	86.4

Alligator River routes.—All the possible alternative routes for this division of the waterway pass up Alligator River. This river empties on the south side of Albemarle Sound near its eastern end. It is about 4 miles wide at its mouth and for 20 miles upstream it is nearly straight and from 2 to 4 miles wide. Its bottom is sandy and flat and its depth generally from 9 to 15 feet. All routes by this river extend from deep water in the sound to a "common point" near the head of the straight portion of the river. The length of this section is 28.1 miles, of which 4.2 miles is in deep water in Albemarle Sound. The water in this river is nearly free from sediment, and maintenance of a dredged cut will probably not be difficult.

From the "common point" in Alligator River there are several different possible routes, all passing through the swamps of Hyde County, N. C. The principal feature of this county is Lake Mattamuskeet. This lake is a large but shallow body of fresh water. It is about 16 miles long by 6 miles wide. Its level varies with the rainfall, but in the dry season is only about 2 feet above the level of Pamlico Sound. Its general depth is about 2 feet, but in some places it is from 3 to 5 feet deep. The lake is surrounded by a rim-like ridge from 7 to 10 feet above sound level. The summit of this ridge is generally 100 yards or so from the lake shore, but on the east side it recedes to a distance of about one-half mile. From this summit the ground slopes off in all directions, except toward the mainland on the northwest, soon becoming low and swampy. The surface of the lake was formerly much higher than at present and has been artificially drained to its present level by several canals cut to Pamlico Sound. The bottom of the lake is quite sandy.

The Alligator River routes all pass either through the lake or through the swamps just outside its rim to some of the numerous bays along the shore of Pamlico Sound. These bays all have the same general characteristics, being wide at their mouths and gradually decreasing in width and depth and having broad marshes extending far out from the banks. Through these marshes narrow, crooked creeks or drains find their way.

Long Shoal route.—The most eastern of the routes passes from Alligator River to Long Shoal River, through the swamp near Whipping Creek Lake. There is at present between these two points a crooked passage available for skiffs. This passage is too crooked for use, but through the swamp a nearly straight passage about 8 miles long can be located not touching any high ground.

The length of this route is:

	Miles.
Albemarle Sound to "common point" in Alligator River	28.1
Thence to head of Long Shoal River	8.9
Thence to deep water in Pamlico Sound	9.0
Thence across Bluff shoal to point near Brant Island light	36 5
Total	82.5

Far Creek route.—This route proceeds from the "common point" in Alligator River across by the shortest line to deep water in Pamlico Sound, reaching the shore of the sound near Far Creek. Except for a narrow strip of farm land near Pamlico Sound, it passes generally through a low swamp covered with a dense growth. The elevation along this route does not exceed 5 or 6 feet.

The length of this route is:

	Miles.
Albemarle Sound to "common point" in Alligator River	28.1
Thence to deep water in Pamlico Sound	16.5
Thence across Bluff shoal to point near Brant Island light	30.6
Total	75.2

Wyesocking route.—Another route is possible that would pass from Alligator River to the head of Wyesocking Bay, and through that bay to deep water. This route is evidently more expensive than that by Far Creek, has no advantages over it, and will not be further considered.

All of the above routes avoid Lake Mattamuskeet, but enter Pamlico Sound above Bluff shoal.

Juniper Bay route.—This route passes through the lake, and except for the belt of cultivated land around the lake it is located through the marshes or swamps adjacent to the bay and river. It and all succeeding routes avoid Bluff shoals.

The length of this route is:

	Miles.
Albemarle Sound to "common point" in Alligator River	28.1
Thence through lake to bay to deep water	32.4
Thence to point near Brant Island light	10.0
Total	70.5

Swan Quarter route.—This route is similar to the one just described. It passes through the lake and thence to Swan Quarter Bay. It is longer and more expensive than the preceding one, possesses no additional advantages, and will not be further considered.

Rose Bay route.—This route passes to the west of the lake through the swamp adjacent to the upper Alligator River, thence through the neck that joins the rim around Lake Mattamuskeet with the mainland at a maximum elevation of about 10 feet, thence to Rose Bay. Alligator River from the Fairfield Canal where this route crosses it to the "common point" at the head of the lower river is quite crooked. For several miles it is narrow and deep, 30 feet being found in places. As it widens out its depth decreases, and near the lower end of this part shoals of 6 and 8 feet are found. The banks of the river are marshy and swampy, the immediate margin consisting of a semifloating mass of vegetation. Some of this frequently gets dislodged and floats downstream, and some of the points of the river have actually been sawed off. This part of the river is so crooked that it would be cheaper to cut straight through the swamp, and this is the line laid out.

The length of this route is:

	Miles.
Albemarle Sound to "common point" in Alligator River	28.1
Thence to deep water in Pamlico River	30.6
Thence to point near Brant Island light	21.8
Total	80.5

All of these Alligator River routes pass for considerable distances through swamps, and it is believed that these portions can be maintained at slight expense. Through the high land, and especially through the lake, it will be necessary to revet the banks.

THIRD DIVISION—FROM PAMLICO SOUND TO BEAUFORT INLET.

All the routes in this division of the waterway will, for comparison, be supposed to start at the "common point" in Pamlico Sound and to end in deep water just inside Beaufort Inlet. There are at present two waterways in use between these two points—one via Core Sound and the other via the Neuse River and the Clubfoot and Harlowe Canal. The proposed waterway may therefore follow either of these or some alternative route.

Core Sound route.—This route passes through Core Sound, The Straits, and North River.

Core Sound.—This is a narrow, shallow sound lying next to the ocean and separated from it by the barrier reef only. It has practically no tide, its elevation being affected by winds only. The part of it included in this route is about 27 miles long and averages 3 miles wide. Its depth along the existing channel is generally about 7 or 8 feet, with a few places as deep as 10 feet and a number of shoals of less depth than 6 feet. The existing channel is very crooked, and if this route be chosen for the waterway a new and practically straight channel should be dredged. This would pass over places where the depth at present is less than 4 feet.

The Straits.—This name applies to the branch of Core Sound between Harker Island and the mainland. It is about 5 miles long and averages less than one-half mile in width. The channel through it is slightly crooked, is of sufficient width, and has depths ranging from 10 to 20 feet. To straighten it and to deepen it at the shoal places would require that it be dredged throughout nearly its whole length.

North River.—The part of this river from The Straits to the deep water inside Beaufort Inlet is about 5 miles long and has a channel slightly curved and of irregular depth. Dredging would be required for about half the distance.

This, the *Core Sound route*, throughout its whole length lies parallel to and close to the ocean and is subject to all prevailing storms. The bottom is composed generally of shifting sand, and except in The Straits and in North River its maintenance would probably be difficult and expensive, especially at the entrance from Pamlico Sound.

The distance by this route is:

	Miles.
Deep water, Pamlico Sound	9.1
Core Sound	26.7
The Straits	5.0
North River	5.0
Total	45.8

Alternative routes.—All other possible routes in this division pass up the part of Neuse River where it is wide and straight and generally exceeds 20 feet in depth. Between it and Core Sound is a neck of land averaging 10 miles in width and generally low and flat, its elevation not exceeding 10 feet above low-tide level. On both the ocean side and the Neuse River side of this neck are a number of shallow creeks. These creeks near their mouths are very wide, gradually narrowing up toward their heads and become little more than crooked ditches winding through broad marshes. In several places the heads of the creeks on opposite sides of the neck come within 3 or 4 miles of each other, thus offering possible routes for the waterway.

Adams Creek route.—Adams Creek empties into Neuse River where the river is over 20 feet in depth. For 6 miles from the 17-foot curve in the river this creek is from 1,500 to 2,000 feet wide and has but a single bend. The natural depth within this distance is from 9 to 12 feet. At the head of this section of the creek it divides, one branch proceeding off at a right angle; the other branch continuing for about 2 miles farther, gradually decreasing in width and depth. At the head of this creek there is a neck separating it from the head of Core Creek on the ocean side. The distance across this neck is about 4 miles and its elevation does not exceed 10 feet.

Core Creek.—Core Creek is a tidal estuary of Newport River. Its banks are marshy and through these marshes a practically straight channel can be dredged to the marsh of Newport River. Below the marsh in Newport River less than one-half mile of dredging would be required before reaching the deep water at and below Morehead City, which deep water extends to the bar at the inlet.

This route throughout its entirety will be protected from storms, and it is believed that the maintenance of a channel will not be difficult.

The distance by this route is:

	Miles.
"Common point" to Neuse River opposite Adams Creek	28.4
Adams, Core Creek, Newport River to Beaufort Inlet	21.6
Total	50.0

Clubfoot and Harlowe Canal route.—This route passes up Clubfoot Creek, thence by a small canal to Harlowe Creek, and thence to Newport River.

Clubfoot Creek.—This creek empties into Neuse River about 6 miles above the mouth of Adams Creek and several miles above the end of the deep water in that river, and should this route be chosen several miles of dredging will be necessary in Neuse River.

Clubfoot and Harlowe Canal.—This canal, owned by a private corporation, is about 4 miles long, about 30 feet average width, and at low water its available channel is less than 2 feet in depth. It was constructed a number of years ago and at one time was well maintained, but in recent years little has been done in the way of maintenance and tolls are no longer collected. The material excavated was placed right on the bank and is constantly slipping into the canal.

Harlowe Creek.—This, like Core Creek, is a tidal estuary of Newport River, but it is not as wide nor as deep nor as straight as Core Creek, and has the additional disadvantage of emptying into Newport River several miles higher up.

While the existence of this canal would naturally call attention to this route, its value in the present consideration is more apparent than real. It was not located at the narrowest or lowest part of the neck nor between the creeks best suited to the purpose, the principal object in its location having been apparently to obtain the shortest distance from Newbern to Beaufort. The prism of its excavation is very small compared with that desired for the waterway, and as the material excavated has been placed right on the top of the bank, at least half of it will have to be moved over again, and this route has the disadvantage of requiring several additional miles of dredging in both Neuse and Newport rivers. Compared with the Adams Creek route it is longer, requires more dredging, and is therefore more expensive, and is no more secure from storms. It will therefore receive no further consideration.

Other routes.—There are other pairs of creeks which might possibly be used, but an examination of the map will show that there is no other pair so favorably located as that which has been considered.

FOURTH DIVISION—BEAUFORT INLET.

The bar at Beaufort Inlet, though subject to changes, as are all the bars on this coast, is one of the least unstable. It has a great advantage over Ocracoke and the other inlets on Pamlico Sound, in that there is no interior bar, and once the ocean bar is passed deep water is found. At present there is a channel 14 feet deep at low water. The distance between 20-foot contours inside and outside of the bar is about 4,200 feet, and between 30-foot contours about 5,800 feet.

CHARACTER OF MATERIAL TO BE EXCAVATED.

No borings have been made under the direction of the Board, the available funds not being sufficient for that purpose, but it is believed that within the limit of depth no material will be met with that can not be easily excavated. In the report of Mr. Abert, above referred to, there are given the results of borings made at Fort Monroe, near Edenton, on the shore of Lake Mattamuskeet, and along the Clubfoot and Harlowe Canal. At none of these places was any rock found near the surface. Other information obtained from various sources all serves to corroborate this. It is believed, therefore, that the only material that will be met with will be sand, mud, or clay, and an occasional deposit of shells. In many places, however, sunken logs and old trees and stumps will have to be removed. In constructing the existing canals the material excavated has been placed right on top of the banks. This is objectionable and should be avoided in constructing the new waterway, because by its weight the material thus placed on the banks increases bank caving, and a large part of it eventually slips back into the channel, and should enlargement of the canal be desired this material must all be again moved.

In most of the land cuts and in the narrow parts of rivers it is thought that the earth can be removed most economically and advantageously by hydraulic dredges, which will pump it back on the banks behind an embankment previously constructed some distance from the immediate edge. On solid ground this berme need not be wide, but in the marshes it should not be less than 100 feet. In the wider parts of rivers and their entrances the material will probably be best removed in scows; while on the bars at Beaufort, Bluff shoals, and similar localities self-propelling hydraulic dredges can probably be used, pumping the material into bins in the hulls of the dredge and then steaming away to the dumping grounds and emptying them. This has been found to be a most economical method of removing sand from exposed places, but it is not very efficient in mud.

In estimating the unit cost of the different kinds of material to be met with, the Board has assumed that it will be disposed of as above, and that the cost will vary from about 10 cents per cubic yard for some of the material to be removed hydraulically, up to 25 cents for that to be taken away in scows.

CROSS SECTION OF THE WATERWAY.

By the act directing the survey the depth of the desired waterway is fixed at "not less than 16 feet," and in consequence the calculations of quantities and cost have been based upon a channel of that depth;

but in order to insure at least that depth and to allow for slight errors in the determination of the datum plane, all calculations have been based upon an excavation to a depth of 17 feet at mean low water, except at Beaufort Inlet, where, owing to the exposure to ocean swells, the depth of 20 feet has been used.

In Norfolk Harbor and its tributaries and at Beaufort and its tidal tributaries the datum used has been mean low water, determined as closely as possible from all obtainable data. In the sounds and their tributaries no appreciable lunar tide exists, the fluctuations in water level being due to the wind effect and depending upon the degree of exposure to and the intensity and duration of the winds. In Currituck Sound it is stated that the water level has been depressed as much as 4 feet, and in Alligator River and some of the bays along Pamlico Sound the depression has amounted to nearly 2 feet. In making these calculations, however, no account has been taken of these extreme fluctuations, the datum assumed being based upon such low waters as are occasioned by winds of ordinary intensity and duration.

The width of the channel in land cuts has been fixed by the least that will allow two large barges or steamers to pass with safety. This has been assumed at 90 feet. In places where the banks can not be used as guides to navigation this width has been considerably increased.

The side slopes used in making these calculations and estimates are based upon a study of the actual slopes in the existing canals and dredged channels, being about the average of those found. In some places the slopes seem to stand at a steeper angle and in others at a flatter.

Based on the above considerations the calculations of quantities and cost have been made upon the following cross sections:

	Bottom width.	Side slopes.
	Feet.	
In excavations through dry land	90	1 to 2½
In narrow parts of rivers	125	1 to 3
In wide portions of rivers, in bays, and the entrances to them, and in Currituck Sound	250	1 to 3
In open sounds and across bars in North River, and at Beaufort Inlet	300	1 to 5

Allowance has been made for increasing these widths at bends.

BANK REVETMENT.

In the existing canals and dredged cuts it has been found that at a number of places there is a tendency of the waves of passing vessels to cut away the sandy banks and to draw the material down into a gently sloping beach. This action seems to be the greatest at and near the water surface. To overcome this difficulty, lines of sheet piling have been driven and have proved quite successful; consequently there has been included in the estimates for the new waterway the cost of similar revetments. The design considered is a line of properly braced sheet piling driven in the slopes of the waterway where the normal depth of water is about 5 feet, the penetration of the piling in the bottom to be about 12 feet, and the top to project about 3 feet above the normal water surface. The cost of such a revetment is estimated at $1.50 per linear foot of revetment or $3 per linear foot of waterway.

RIGHT OF WAY.

In the rivers, bays, and sounds no right of way will have to be purchased, but in the land cuts and across the bends of rivers it will be necessary to buy the land not only through which to dig the waterway itself but upon which to deposit the excavated material. The cost of this land must be considered in making the estimate for the waterway, and it has been assumed that an average width of 800 feet must be purchased; in some places more may be needed and in others possibly not so much.

DRAWBRIDGES.

Another item of cost that must be considered is that of drawbridges across the waterway at various places. Across all existing canals and across the Elizabeth and Pasquotank rivers such bridges now exist, and should any of these localities lie on the route of the new waterway the openings through these bridges must in most cases be widened to accommodate the expected increase in the size of vessels, and whatever may be the route selected a number of new bridges will have to be built and a number of old ones remodeled. The drawspans of these bridges should have a clear width of not less than 60 feet and should be properly protected by fenders. As it is probable that they must be opened and closed many times a day, their mechanism must be efficient and must provide for rapid maneuvering. The cost of these bridges is estimated at $10,000 for each wagon bridge and $50,000 for each single-track railroad bridge. No double-track bridges exist at present.

CHARACTER OF WATERWAY.

Before entering into a comparison of the different possible routes for the waterway, there is an important question to be decided: Shall the waterway be constructed as a "sea-level" one or shall it contain a higher level reached by locks? Of the two main existing canals, the Albemarle and Chesapeake is practically a sea-level one, while the Dismal Swamp Canal contains one high level.

In considering a canal with a high level the important factor is a water supply, and of the possible routes for the waterway the Dismal Swamp Canal alone fulfills this requirement. It is fed from Lake Drummond. With a view of determining the question of the sufficiency of this lake as a source of water supply, should the waterway be constructed by the Dismal Swamp Canal route and with a high level at about the same elevation as at present, an investigation was made under the direction of the Board. As a result of this investigation it would appear that the area of the lake is about 4.82 square miles, or approximately 135,000,000 square feet. The elevation of the surface of the lake at high level is about 23.2 feet above mean low water at Norfolk, its normal stage being about 1 foot lower.

The records of the Weather Bureau at Norfolk show that during one dry spell there was a period of one hundred and six days in which time the total precipitation was only 1.53 inches. It has been shown that a heavy rainfall will raise the level of the lake about 1.5 feet for every inch of precipitation, but during a period of prolonged drought the run-off must be much less than this, and consequently this precipitation of 1.53 inches was probably equivalent to an increase in lake level of less than 2 feet. During a drought evaporation is usually heavy, and during a period of one hundred and six days it would have to average only about one-fifth of an inch a day to overcome the effect of the precipitation; so it may be assumed that during such a prolonged drought the precipitation would not be more than sufficient to balance the evaporation.

The surface of the lake at high water is about 11 feet above the normal surface of the canal, and assuming that about 10 feet of this could be utilized, it would mean a total supply of about 1,350,000,000 cubic feet, or in a prolonged drought of 106 days, an average of about 12,500,000 cubic feet a day to supply all lockage, leakage, seepage, and absorption by the banks. Assuming the losses at the low figure of 500,000 cubic feet a day, 12,000,000 cubic feet a day are left for lockage.

The locks on the new waterway should not be less than 300 by 60 feet, and assuming the average lift at about 11 feet, there would be required for each lockage about 200,000 cubic feet, and the daily supply of 12,000,000 cubic feet would allow 60 lockages per day, or 30 cycles for each lock.

If vessels would come to a lock alternately in each direction, one lockage would pass one vessel up and one down, and, considering both ends of the canal, two lockages would pass one vessel in each direction. If they do not come in such regular alternative order more lockages per vessel are required, and this may reach two lockages per vessel if they come in the same direction nearly all the time. Assuming, therefore, that about one and one-half lockages are required to pass each vessel through the canal, it would mean that during a prolonged drought, such as has been experienced, the water supply would be sufficient to pass only 40 vessels per day. As the total number now passing through the two canals averages about 25 per day it is apparent that the water supply will only permit an increase in traffic of about 60 per cent, unless it be assumed that a number of the vessels are so small and come in such order that several can be locked through together.

As this calculation is based upon the beginning of the drought, finding the lake full, which is not probable, it is evident that the basin of Lake Drummond is not large enough to furnish sufficient water for the new waterway and the commerce that is expected to pass through it.

Another matter to be considered in this connection is whether the great fluctuations in the water level in Lake Drummond, caused by the demands upon it of an enlarged canal, would not affect the interests and rights of parties owning parts of the lake or its border lands. Into this question it is not necessary to go further than to note that a lawsuit has already been brought against the Lake Drummond Canal and Water Company, the present owner of the Dismal Swamp Canal, for damages caused to standing timber by changes in the level of the lake. As to what is the status of this lawsuit the Board is not informed, but it indicates the possibility of continual litigation of the same character should the United States undertake to construct and supply an enlarged canal from the lake, unless all such questions were solved by the purchase of the entire lake and its surrounding lands.

Leaving out all consideration of the possibility of the water supply being insufficient and the question of damages above referred to, there are other disadvantages appertaining to a high-level canal—the delay to vessels in locking, not only while actually in the lock, but also while waiting their turn; the difficulty of handling rafts, barges, and vessels not self-propelled; the cost of maintaining the locks and of operating them, and the difficulties attending any further enlargement.

After a consideration of all these and other points, the Board is of the opinion that the waterway as constructed should be at "sea level," and in comparing the different possible routes they all have been considered with reference to their feasibility for the construction of a "sea-level" canal.

Tidal locks.—The construction of a "sea-level" canal, however, does not necessarily mean that all locks can be done away with, as the level of the water at the two ends of the canal may not always be at the same height. The level of Albemarle Sound and tributaries is affected only by the winds, while in the Elizabeth River there are the usual lunar tides, the average fluctuation being about 3 feet. In the present Albemarle and Chesapeake Canal this difference in height between the water at the ends of the route is concentrated at the lock, and if the lock did not exist this difference in level would be distributed over a considerable length of the canal and there would be currents through it. The existence of a current is not of itself a disadvantage unless it be so strong as to erode the banks of the canal or to impede navigation, and as the current will alternate in direction somewhat regularly, the existence of a moderate current at times would be of advantage in the handling of rafts and barges.

The necessity, therefore, for the existence of a tidal or guard lock depends upon the extreme difference in level and the currents produced by it. Under the direction of the Board an investigation of this subject has been made by Asst. Engineer A. B. Nichols. As a result of his investigation, he has concluded that the maximum difference of level between the water in Elizabeth River and that in Currituck or Albemarle sound would probably not exceed 11 feet, and this would be produced only by the most extraordinary storm conditions. Under ordinary circumstances this difference would not exceed 4 feet.

Assuming that the 4 feet is distributed through the canal, both the slope and the current would be so small as not to do any damage or interfere with navigation. Should the maximum difference stated above obtain, it is probable that the current would attain a dangerous aspect, and as even the smaller difference may be accumulated within a short distance, a tidal lock is considered as desirable between Norfolk and Albemarle Sound, and the cost of such a lock has been included in the estimates.

Between Albemarle and Pamlico sounds no such lock is thought to be necessary, and experience in the present Clubfoot and Harlowe Canal between Neuse River and Beaufort Inlet would seem to show that none will be needed there.

The gates in the tidal lock must be so designed as to operate with the higher level at either end of the lock, and to accomplish this with the ordinary form of miter gates two pairs of gates at each end of the lock will be required.

Under ordinary conditions there will be four times in each twenty-four hours when the water at the two ends of the lock will be at the same level, and all gates can be left open. As during the time all gates are open vessels can pass through freely, it is to be desired that this period be prolonged as much as possible. With miter gates of the usual design it is not possible to do this for any considerable length of time, for until the water surfaces at the two ends of the lock are almost at the same height it is impossible to open the gates against the hydraulic head; and, on the other hand, on account of the danger of damaging the gates in closing them when the hydraulic head or its resulting current has become at all great, the gates must be closed soon after the neutral point has passed.

There are, however, some forms of horizontal gates of the Parker or bear-trap variety which work equally well with high water on either side and which can be operated with safety under a large hydraulic head. If such a form of gate could be used in the lock, only two would be required and they could both be lowered at any time, and the lock would be thus left free from obstructions, and when the current became too strong for navigation the gates could be raised. Indeed, with such a form of gate it might be found that the gates could be left down throughout the entire ordinary tidal oscillation, being raised during times of extraordinary conditions only. While the Board is not fully informed as to the possibility of designing gates of this particular form for this use, it believes that, if it can be done, the gates of this tidal lock should be of such a design that they can be opened or closed at will, whatever may be the relative height of the water at the two ends of the lock. Such a design would remove from the lock much of its character as an obstruction and hindrance to commerce and would make it what is called a "guard" lock, to be used as a protection in time of danger only.

The chamber of the lock should not be of less dimensions than 300 by 60 feet in the clear, and, without entering into the details of construction, the Board is of the opinion that such a lock can be constructed for about $100,000.

COMPARISON OF ROUTES.

First division, Norfolk to Albemarle Sound.—In this division there are four possible routes—the Dismal Swamp Canal route, the Albemarle and Chesapeake Canal route, the Cooper Creek route, and the Blackwater route. These routes have been described, and estimates will now be made of the cost of constructing the waterway by each.

Dismal Swamp Canal route.

Excavation:	
In Elizabeth River and Deep Creek (6.5 miles), 2,800,000 cubic yards, at 15 cents	$420,000
In canal (23.1 miles), 21,000,000 cubic yards, at 12 cents	2,520,000
In Turners Cut and upper Pasquotank to mouth of Cooper Creek (8.2 miles), 3,400,000 cubic yards, at 15 cents	510,000
In lower Pasquotank (22 miles), 6,500,000 cubic yards, at 15 cents	975,000
Total, 33,700,000 cubic yards (59.8 miles)	4,425,000
Retaining walls, 314,000 feet, at $1.50	471,000
Right of way, 2,200 acres, at $50	110,000
Bridges	130,000
Length of route, 67.6 miles; estimated cost	5,136,000

To this must be added the purchase price of the canal. In estimating the area to be purchased for right of way the land owned by the canal company has not been considered.

Albemarle and Chesapeake Canal route.

Excavation:	
In Elizabeth River (8.9 miles), 4,200,000 cubic yards, at 15 cents	$630,000
In canal (Virginia Cut) and upper North Landing River (18.7 miles), 10,500,000 cubic yards, at 12 cents	1,260,000
In lower North Landing River, Currituck Sound, and Coanjock Bay (17.3 miles), 8,600,000 cubic yards, at 15 cents	1,290,000
In canal (Carolina Cut), (2.8 miles), 950,000 cubic yards, at 12 cents	114,000
In North River (11.5 miles), 5,200,000 cubic yards, at 15 cents	780,000
North River bar (2.8 miles), 600,000 cubic yards, at 25 cents	150,000
Total, 30,050,000 cubic yards (62 miles)	4,224,000
Retaining walls, 260,000 feet, at $1.50	390,000
Right of way, 900 acres, at $40	36,000
Bridges	130,000
Length of route, 68.6 miles; estimated cost	4,780,000

To this must be added the purchase price of the canal. In estimating the area to be purchased for right of way the land owned by the canal company has not been considered.

Cooper Creek route.

Excavation:	
In Elizabeth River (5.3 miles), 1,900,000 cubic yards, at 15 cents	$285,000
From Elizabeth River to Pasquotank River (26.9 miles), 23,200,000 cubic yards, at 12 cents	2,784,000
In Pasquotank River (22 miles), 6,500,000 cubic yards, at 15 cents	975,000
Total, 31,600,000 cubic yards (54.2 miles)	4,044,000
Retaining walls, 300,000 feet, at $1.50	450,000
Right of way, 3,300 acres, at $60	198,000
Bridges	130,000
Length of route, 62 miles; estimated cost	4,822,000

There are no canal rights to be purchased on this route.

Blackwater route.

Excavation:	
In Elizabeth River (8.9 miles), 4,200,000 cubic yards, at 15 cents	$630,000
Thence to mouth of Blackwater River (14.4 miles), 14,000,000 cubic yards, at 12 cents	1,680,000
In North River, Currituck Sound, and Coanjock Bay (17.3 miles) 8,600,000 cubic yards, at 15 cents	1,290,000
In canal (Carolina Cut) (2.8 miles), 950,000 cubic yards, at 12 cents	114,000
In North River (11.5 miles), 5,200,000 cubic yards, at 15 cents	780,000
North River bar (2.8 miles), 600,000 cubic yards, at 25 cents	150,000
Total, 33, 550, 000 cubic yards (57.7 miles)	4,644,000
Retaining walls, 260,000 feet, at $1.50	390,000
Right of way, 1,200 acres, at $50	60,000
Bridges	130,000
Length of route, 64.3 miles; estimated cost	5,224,000

To this must be added the purchase price of the Carolina Cut of the Albemarle and Chesapeake Canal.

In comparing these different routes an important point to be noticed is that the Dismal Swamp Canal route is a much more expensive one than that by Cooper Creek, and as these two routes have common termini, and as throughout their divergent portions they pass through essentially the same character of country, they are about equal as regards their probable cost of maintenance; and, consequently, the Cooper Creek route being the shorter and the cheaper line is the one to be preferred, even on the supposition that all the rights and property of the Dismal Swamp Canal Company will be ceded to the United

States free. In fact, the importance of the Dismal Swamp Canal in the consideration of the possible routes for a waterway at "sea level" is more apparent than real. In its present condition the bottom, even of the canal, is above sea level, its cross section is small compared with that desired for the new waterway, and as all the excavated material has been placed on the immediate banks, approximately half of this material must be moved again on whichever side the enlargement be made. As has been stated, the Dismal Swamp Canal was not located on the shortest line between its termini nor along the lowest profile, and this route being longer and more expensive than that by Cooper Creek, and having no advantage over this latter route need not, in the opinion of the Board, be further considered.

In comparing the Blackwater route and that by the Albemarle and Chesapeake Canal it will be noticed that the latter is the least expensive. They are about equal as regards the probable cost of maintenance, and have the same disadvantages in passing through the exposed portion of Currituck Sound and across the difficult North River bar. The only advantage possessed by the Blackwater route is that it avoids the Virginia portion of the canal and would not require that part of the canal to be purchased, but as it passes through the North Carolina part of the canal, and as the opening of a waterway by the Blackwater route would render the Virginia part of the canal worthless, it is probable that it will cost no more to purchase the whole canal than the Carolina part of it. Of these two routes, then, that by the Albemarle and Chesapeake Canal is to be preferred.

The choice of routes in this division of the waterway is therefore, by the above considerations, restricted to the Cooper Creek route and that by the Albemarle and Chesapeake Canal.

Comparing these two routes and assuming for the purpose of comparison that all the rights and property of the canal company would be ceded to the United States free, the route by the canal seems to have the advantage of a slightly smaller first cost, the difference being about $42,000 in a total of about $5,000,000. If, however, the cost of maintenance be considered the advantage is on the other side. The Cooper Creek route passes for practically its whole extent through the interior, where the cost of maintenance will be light, while the canal route passes for a long distance through the open part of Currituck Sound. Here the excavated channel will be exposed to cross winds and currents, and judging from past experience in maintaining the present channel, 9 feet deep, only 2 feet below the natural bottom, the preservation of the deep channel required for the new waterway will not be easy, unless its original width and cost be considerably increased. The canal route passes also across North River bar, another place where the natural depth is small and the deterioration of a dredged cut has been shown to be rapid.

As opposed to the North River bar, the Cooper Creek route passes across the bar of the Pasquotank, where the natural depth is greater, and its maintenance will consequently be probably less difficult. As regards navigation, the canal route is several miles longer, and vessels passing by it will, while in Currituck Sound, be exposed to the winds and storms from the open ocean. It has also another great disadvantage, in that the water level in Currituck Sound is subject to greater fluctuations, and especially depressions, than any other portion of these water routes. On the other hand, on the Cooper Creek route, on account of its protected position, the depressions of the water surface are expected to be far less. Taking into consideration, therefore, not only the first cost, but also the probable cost of maintenance, the ease of navigation, the lengths of the two routes, the question of the relative protection from storm, and the fluctuation in the water level, the Board is of the opinion that the Cooper Creek route is the better, and in the long run will prove the cheaper, even on the assumption that the rights and property of the canal company could be acquired free.

By the act of Congress under which the Board is acting it is ordered that "any report made shall include the probable cost of any private waterway that it may be to the interest of the United States to acquire in connection with the proposed improvement." Having this provision of the law in view, the Board, immediately after its organization, made an attempt to obtain the probable cost of the purchase of each of the existing canals. Letters were written, soon after the Board held its first meeting, to the two companies, but in response to these letters no definite replies were received. In August, 1903, another attempt to get this information was likewise unsuccessful, the companies, through their representatives, replying that the matter must be referred to the stockholders in the fall of 1903. In the absence of such offers of sale the Board is unable to state at what price either of the canals can be acquired. Nor is the Board able to state what would be a fair price to offer for either canal. To be able to do this would require a much more extended survey of the canals than the Board was able to make, and a further extensive examination into the records, accounts, papers, and titles of the canal companies, which was impracticable.

The law is mandatory, however, only as to "any private waterway that it may be to the interest of the United States to acquire." In the opinion of the Board it is not to the interest of the United States to acquire any of the existing waterways, for the reason that the Cooper Creek route appears to be the best and really the least expensive line for the waterway, and by adopting it all complications as to the purchase of either the whole or a part of either of the existing canals are avoided.

The Board has therefore no hesitation in recommending for this division of the waterway the Cooper Creek route. This route from Norfolk to the "common point" in Albemarle Sound is 62 miles long. There will be required about 31,600,000 cubic yards of excavation, over 54.2 miles of the distance, and the total cost of this division of the waterway, including a guard lock, is estimated at $4,922,000.

Second division, Albemarle Sound to Pamlico Sound.—In this division of the waterway there are five possible routes, the Croatan Sound route, and four others via Alligator River—the Long shoal route, the Far Creek route, the Juniper Bay route, and the Rose Bay route.

Croatan route.—By this route there would be no expense for right of way, retaining walls, or bridges.

Croatan route.

Excavation:	
In Croatan Sound (41 miles), 11,500,000 cubic yards, at 20 cents	$2,300,000
At Bluff shoal (2 miles), 600,000 cubic yards, at 12 cents	72,000
Total, 12,100,000 cubic yards (43 miles)	2,372,000
Length of route, 86.4 miles; estimated cost	2,372,000

Long shoal route.

Excavation:	
In Alligator River (24 miles), 7,500,000 cubic yards, at 15 cents	$1,125,000
In swamp (9 miles), 4,000,000 cubic yards, at 12 cents	480,000
In Long Shoal Bay (9 miles), 3,000,000 cubic yards, at 16 cents	480,000
At Bluff shoal (2 miles), 600,000 cubic yards, at 12 cents	72,000
Total, 15,100,000 cubic yards (44 miles)	2,157,000
Retaining walls, 100,000 feet, at $1.50	150,000
Right of way, 800 acres, at $25	20,000
Length of route, 82.5 miles; estimated cost	2,327,000

Far Creek route.

Excavation:	
In Alligator River (24 miles), 7,500,000 cubic yards, at 15 cents	$1,125,000
Across to shore of Pamlico Sound (10.2 miles), 6,000,000 cubic yards, at 12 cents	720,000
In Pamlico Sound to deep water (5.5 miles), 1,200,000 cubic yards, at 16 cents	192,000
At Bluff shoal (2 miles), 600,000 cubic yards, at 12 cents	72,000
Total, 15,300,000 cubic yards (41.7 miles)	2,109,000
Retaining walls, 110,000 feet, at $1.50	165,000
Right of way, 1,000 acres, at $40	40,000
Bridges	10,000
Length of route 75.2 miles; estimated cost	2,324,000

Juniper Bay route.

Excavation:	
In Alligator River (24 miles), 7,500,000 cubic yards, at 15 cents	$1,125,000
Across to head of bay (22.7 miles), 12,000,000 cubic yards, at 12 cents	1,440,000
In Juniper Bay (8.7 miles), 3,200,000 cubic yards, at 16 cents	512,000
Total, 22,700,000 cubic yards (55.4 miles)	3,077,000
Retaining walls, 220,000 feet, at $1.50	330,000
Right of way, 2,100 acres, at $50	105,000
Bridges	30,000
Length of route, 70.5 miles; estimated cost	3,542,000

Rose Bay route.

Excavation:	
In Alligator River (24 miles), 7,500,000 cubic yards, at 15 cents	$1,125,000
Across to shore of Rose Bay (27.8 miles), 15,500,000 cubic yards, at 12 cents	1,860,000
In bay (3.5 miles), 1,500,000 cubic yards, at 15 cents	225,000
Total, 24,500,000 cubic yards (55.3 miles)	3,210,000
Retaining walls, 250,000 feet, at $1.50	375,000
Right of way, 2,600 acres, at $40	104,000
Bridges	30,000
Length of route, 80.5 miles; estimated cost	3,719,000

In comparing these routes, it will be noted that the first three routes all debouch into Pamlico Sound above or just below Long shoal, and pass thence through the open part of the sound and across Bluff shoal. Of these three routes the Long shoal route and Far Creek route are about equal in cost and are slightly less expensive than the Croatan route; they also have the greater advantage of a more sheltered location, and because of this sheltered position they will probably be more easily maintained. Experience has, in fact, shown that a dredged cut in Croatan Sound soon shoals up, while there is reason to believe that such will not be the case in Alligator River. Consequently there is no reason for choosing the Croatan route in preference to either of the other two.

Between the Long shoal route and the Far Creek route there is little difference; they are practically of the same cost and enter Pamlico Sound at about the same point. The Far Creek route is the shorter in total length and is also shorter by 3.5 miles in the dredging through the shoal margin of the sound, where alone there is reason to fear any difficulty in maintenance; consequently it is, in the opinion of the Board, the better of the two. It is, in fact, the cheapest route for the waterway in this division.

The Juniper Bay route and the Rose Bay route both enter the deep water of Pamlico River and avoid Bluff shoal. In this respect they are equal, and in cost the Juniper Bay route has a slight advantage. This bay, however, is quite open and exposed to southeasterly storms; the deep water is far from the shore, and the long dredged channel through the shallow water will probably not be easy to maintain. Rose Bay, on the other hand, is, by its position, well protected from storms, and, as the deep water makes far up into the bay, there is formed a harbor well protected by marshes on either side. The dredged cut from the shore to deep water is quite short, and, from its position, its maintenance will probably not cause much trouble. On these accounts Rose Bay is, in the opinion of the Board, preferable to Juniper Bay as a terminus for this part of the waterway.

In the opinion of the Board the Rose Bay route is much the preferable one in this division. Although the estimated cost of the Far Creek route is lower by about $1,400,000 than that by way of Rose Bay, it has the great disadvantage of debouching into the open part of Pamlico Sound, whence a long stretch of open and exposed waterway would have to be traversed in order to reach protected portions of the route, whereas the distance from Rose Bay to the protection of Neuse River is comparatively short. In addition, the exposed Pamlico Sound terminus of the Far Creek line would require the protection of a harbor of refuge at or near that point, costing, in all probability, not less than $1,000,000. In this part of Pamlico Sound storms of great violence are frequent and much damage has been done by them. On the other hand, Rose Bay is in a well-protected location in Pamlico River and has a naturally protected deep-water harbor. The Rose Bay route has also an additional advantage of being conveniently situated with reference to the Pamlico River and the cities and towns located thereon. Taking into consideration these and other matters, the Board is of the opinion that the Rose Bay route possesses sufficient advantages to offset the difference in cost, which difference will be comparatively extremely small when the cost of a harbor of refuge in the vicinity of the mouth of Far Creek is considered. The Board therefore selects the Rose Bay route for the waterway in this division.

The length of this route is 80.5 miles, the excavation required, 24,500,000 cubic yards, and the estimated cost, $3,719,000.

Third division, Pamlico Sound to Beaufort.—In this division the choice of routes, as previously noted, is limited to two—the Core Sound route and the Adams and Core Creek route.

The Core Sound route is 45.8 miles long, and will require the excavation of about 30,000,000 cubic yards, distributed over 3.5 miles of this distance. No expense will be incurred for right of way, bridges, or retaining walls. Its cost is estimated at $4,500,000.

The Adams and Core Creek route is 50 miles long. It will require the excavation of about 9,600,000 cubic yards, distributed over less than 20 miles, the construction of 6½ miles of revetment, the purchase of 600 acres of land for right of way, and the construction of two highway drawbridges. Its cost is estimated as follows:

Excavation, 9,600,000 cubic yards, at 12½ cents	$1,200,000
Revetment, 68,000 feet, at $1.50	102,000
Right of way, 600 acres, at $25	15,000
Bridges	20,000
Total	1,337,000

Compared with the Core Sound route the Adams Creek route will cost less than a third as much, will be cheaper to maintain, is much better protected from storms, and is about 4 miles longer.

The Board therefore considers this the better route, and the one that should be selected.

Beaufort Inlet.—In the three preceding divisions of the waterway the estimates have been based upon an excavation to 17 feet below the assumed mean low water. Here however, on account of exposure to the ocean swells, it is thought well to increase the depth of excavation to 20 feet, and on this depth the estimates will be based. From the 20-foot curve inside to the 20-foot curve on the ocean side of the bar is about 4,200 feet, and the excavation required is about 300,000 cubic yards.

From experience on a similar bar at the mouth of the Cape Fear River it is assumed that the dredging can easily be done by a hydraulic dredge and at a cost not exceeding 15 cents per cubic yard. It is estimated therefore that the cost of the improvement of this bar will amount to $45,000. Its annual maintenance should not exceed one-third of this. As the distance from the junction of the Core Sound and Adams Creek routes inside Beaufort Inlet to the 20-foot curve inside of the bar is 0.8 mile, the total length of this division of the waterway is about 1.6 miles.

ROUTE RECOMMENDED.

The routes selected by the Board in the different divisions of the waterway and their lengths and cost are as follows:

Division.	Route selected.	Length.	Excavation.		Estimated cost.
			Cubic yards.	Length.	
		Miles.		*Miles.*	
First	Cooper Creek	62.0	31,600,000	54.2	$4,922,000
Second	Rose Bay	80.5	24,500,000	55.3	3,719,000
Third	Adams Creek	50.0	9,600,000	19.7	1,337,000
Fourth	Beaufort Inlet	1.6	300,000	.8	45,000
Total		194.1	66,000,000	130.0	10,023,000

The selected route passes from Norfolk up the south branch of the Elizabeth River to near the mouth of Mill Creek; thence in a direct line by a land cut to the Pasquotank River at the mouth of Cooper Creek; thence down this river to and across Albemarle Sound and up the straight portion of the Alligator River; thence in a land cut through the marshes of the upper Alligator River, across the neck of land and into Rose Bay; thence into Pamlico River, down this river, around Brant Island light-house, and up the Neuse River to opposite the mouth of Adams Creek; thence up Adams Creek and by a land cut to the head of Core Creek; thence down Core Creek, Newport River, and across Beaufort bar to the ocean. The length of this route, allowing for a direct line across the deep water of Albemarle Sound, is about 190 miles. This distance can be considerably shortened, and the route will be a better protected one if a cut should be made across Brant Island shoal not far from Brant Island. The Board has not sufficient data upon which to base an estimate for the work, but it will not be great.

This route has the advantages of the greatest possible amount of protection from storms throughout its length, of having safe harbors at each end of every land cut, of passing close to Elizabeth City, Morehead City, and Beaufort, and of being conveniently located with reference to the cities on the Pamlico and Neuse rivers.

In thus expressing its choice of the route the Board desires to specifically state that the selected route has been defined in general terms only, and that before the definite location of the different parts of the route can be made further detailed surveys will be necessary.

The Board is of the opinion that the selected route is a perfectly practicable one and that a waterway can be constructed along it for $10,000,000, provided that the appropriations are of sufficient size and are made with sufficient regularity to allow the work to be carried on constantly and systematically. The annual cost of maintenance of the completed waterway is estimated by the Board at about $150,000.

COMMERCIAL IMPORTANCE.

The termini of the waterway, as defined by the act, are at Norfolk, Va., and Beaufort Inlet, North Carolina, but as Norfolk is at present connected by a deep channel with Chesapeake Bay and the Atlantic Ocean, and Beaufort Inlet opens on the same ocean south of capes Hatteras and Lookout, the object of the waterway is evidently to furnish an inland connection between the Atlantic Ocean at Chesapeake Bay and the same ocean south of both capes.

These two capes, and especially the former, have long been the terror of navigators. Before the introduction of steam the passage around Cape Hatteras was hazardous in the extreme, and though at the present time this cape is not as great an obstacle as formerly, yet it is still a serious menace to navigation. The records of the Life-Saving Service show that within the last quarter of a century not less than $3,000,000 worth of property and 67 lives have been lost in the vicinity of Hatteras alone, and if the records of all the losses between Cape Henry and Beaufort were available the total would be much greater. Indeed, in a recent publication it was stated "that 17 per cent of the vessels trading along the coast are wrecked at this point."

Not only is Cape Hatteras a source of danger, but by reason of the conflicting winds and currents to be met with at that point sailing vessels are frequently delayed in rounding the cape, even when the weather is not stormy enough to be a source of danger. Indeed, these delays have been so frequent that the establishment has several times been seriously contemplated of a line of seagoing tugs to wait near Hatteras to tow away any sailing vessels that might be delayed there.

All these dangers, both of loss and delay, have had their effects upon the rates charged for freight and insurance between the South and North Atlantic ports, and could these dangers be avoided there would, of course, be a considerable saving in these items.

It has been clearly demonstrated in recent years that the cheapest method of transporting bulky freight is in large barges towed by suitable tugs. Transportation by this method is now carried on to a large extent on the Great Lakes, and it has been successfully introduced between points on the Atlantic coast north of the Chesapeake. In all cases the introduction of this method of carrying freight has resulted in the reduction of freight rates by from 30 to 60 per cent.

Owing to the difficulties and dangers due to capes Hatteras and Lookout all attempts to introduce the barge system on our South Atlantic coast have up to the present been unsuccessful, and the traffic around the capes is now carried on almost exclusively in steamers or in large sailing vessels. As south of Beaufort there is no very menacing cape and as possible harbors are quite numerous, there is every reason to believe that the opening of a waterway avoiding these capes would be shortly followed by the extension of the barge method of transportation to our South Atlantic ports, with a resulting decrease in freight and insurance charges.

While it is easy to see that the opening of the waterway would result in a considerable saving in freight charges, it is not so easy to arrive at any reliable conclusion as to the extent of the commerce which would be affected and the amount of freight that would be saved.

Being informed that the Board was investigating this matter the commercial bodies of the various cities on or near the South Atlantic coast undertook to assist, and the letters and statistics received from these commercial bodies are appended to this report.

These cities may be classed as those north of the waterway, those south of it, and those situated along its course. A brief analysis of the papers received from these cities will now be given.

The cities of Baltimore and Norfolk are both situated north of the waterway, and in the papers received from them it is estimated that the saving in freight charges on the commerce to and from them will amount to about $2,250,000 annually.

The ports of Wilmington, Georgetown, Charleston, Savannah, Brunswick, Fernandina, and Jacksonville are all situated south of the southern terminus of the waterway, and from the statistics received from these ports it would appear that their total coastwise trade is now about 4,500,000 tons annually, valued at $225,000,000, practically all of which is with ports north of the Chesapeake. Of this total trade they estimate that about three-fourths will be affected by the new waterway, and that the annual saving in freight charges will be about $2,500,000.

While accepting as sufficiently accurate this statement of the present coastwise trade, the Board nevertheless believes that the effect of the opening of the new waterway upon it has been somewhat exaggerated. That a considerable amount of this commerce would shortly seek a cheaper method of transportation is undoubtedly true, but the Board is more inclined to put the ratio at one-fourth than at three-fourths. This commerce is now largely carried in steamers that give it quick and regular transit, and it would be some time before it would be likely to change to a less regular, though possibly slightly cheaper, method of transportation. Accepting this figure of one-fourth as more nearly correct, we have, as the total present commerce that would be affected by the waterway, about 1,100,000 tons, valued at about $55,000,000. The annual saving in freight on this would probably not be less than $600,000.

The commerce above considered would all, as far as the new waterway is concerned, be "through" freight, but there will also doubtless be a large amount of local freight passing to and from points situated along the line of the canal.

Statements from the existing canals show that in the past few years the total commerce of these canals has amounted annually to about 400,000 tons, valued at $4,100,000 and carried in about 7,000 vessels. As the present conditions of navigation through these canals are such as to restrict the traffic to vessels of small size, and as there is a considerable toll charged, these figures give no basis upon which to estimate the amount of local freight in the new waterway.

Of the cities affected by this local traffic, statistics have been received from Elizabeth City, Washington, and Beaufort. The total commerce of these points is about 1,500,000 tons annually, and they estimate the probable saving in freight charges due to the new waterway at about $750,000.

All the figures given above as to the commercial importance of the new waterway are based upon the traffic at present carried by water, but there are other items which should be considered. There is a large amount of commerce originating at or near the seacoast and now carried to other seaports by rail that would undoubtedly seek water transportation should such transportation be made comparatively cheap and safe. Cheap transportation is one of the most important factors in the development of a country, and the opening up of a cheap and safe route along the middle part of our Atlantic coast would certainly have a very large effect in stimulating trade between the different sections, increasing that already existent, and bringing into being much commerce that at present does not exist.

Especially would this be true of the country to be traversed by the waterway. This region is at present poorly supplied with rail transportation, while its water trade is hampered by the lack of a practicable ocean outlet, the small size of the existing canals, and the toll charges thereon. With these difficulties removed there would undoubtedly be a great and rapid development of this region and its trade.

To what extent and at what rate this increase and development would take place are matters of speculation, but judging from the effects of the opening of the canal between lakes Superior and Huron there is reason to believe that the development would be sufficiently rapid.

MILITARY IMPORTANCE.

From a military and strategic point of view the construction of this waterway would be of great importance. In connection with other canals already existing, it would permit our torpedo boats and small gunboats to pass by an interior and protected route from one part of our coast to another and to thus concentrate at any desired point.

Indeed there are many experts who do not hesitate to say that the importance of the part which this waterway must play in our seacoast defense is sufficient of itself to justify the expenditure of the large amount necessary for its construction.

CONCLUSION.

After carefully considering all available data as to its present and prespective commerce, the Board is of the opinion that the route herein recommended for inland navigation between Norfolk, Va., and Beaufort Inlet, North Carolina, is feasible, and that the estimated cost of the same is not out of proportion to the extent of said commerce added to the importance of the completed waterway as a factor in coast defense.

The following papers and the maps accompany this report and form a part thereof:

Commercial statistics from Baltimore, Md., Norfolk, Va., Wilmington, N. C., Georgetown and Charleston, S. C., Savannah and Brunswick, Ga., Fernandina and Jacksonville, Fla., and Elizabeth City, Washington, and Beaufort, N. C.; general map[a] of the waterway, map[a] of the part from Norfolk to Albemarle Sound, map[a] of the part from Albemarle Sound to Pamlico Sound, map[a] of the part from Pamlico Sound to Beaufort Inlet.

Respectfully submitted.

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Lieut. Col., Corps of Engineers.
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Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

COMMERCIAL STATISTICS.

EXHIBIT A.

LETTER OF THE MERCHANTS AND MANUFACTURERS' ASSOCIATION OF BALTIMORE, MD.

JULY 27, 1903.

DEAR SIR: On behalf of the commercial interests of Baltimore, we beg permission to submit the following facts, figures, and statements as indicative of the importance of this city as a point of shipment, distribution, and transmission of various commodities, and in consequence thereof is one which is vitally interested in the successful prosecution of the project for an inland waterway between the Chesapeake Bay and Beaufort Inlet, North Carolina, as proposed.

This project involves the expenditure of a large amount of money, and in order that the expense may be justified it becomes necessary to demonstrate that when completed the strategic advantages to the Federal Government and the commercial benefits to the several cities or sections affected by its construction will be commensurate with the outlay.

It is not our purpose to discuss the strategic phase of this question, for this belongs to the expert knowledge of the Engineer Corps of the Army and Navy. The several cities and ports affected commercially are also, through their respective mercantile organizations, best qualified to discuss the effect upon their own commerce.

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[a] Not printed; the general map of the waterway is printed in House Document No. 563, Fifty-eighth Congress, second session.

It is our desire to set forth, as briefly as possible, the effect of this project, if completed, upon the commerce of Baltimore, and to discuss certain underlying general conditions which have a bearing upon the subject because of the location, the size and importance of this city, and its transportation facilities.

THE TRAFFIC BETWEEN THE NORTH AND THE SOUTH.

The commercial traffic interchanged between the sections north and south of this proposed inland waterway is transported partly (1) by rail, (2) partly by water, (3) partly by rail and water.

The volume of this traffic is increasing from year to year, owing, first, to the increased production of raw materials in the South and the opening up of the industrial resources of that section; secondly, the increasing diversification of the industrial and agricultural pursuits of the South; and, thirdly, the consequent increased demand for commodities to supply the wants of an enlarged population and more advanced life.

Of this traffic certain forms of perishable articles, or such as require rapid transportation, inevitably seek the all-rail routes between the North and the South. Other articles also take these routes because of their point of origin and destination in the interior or remoteness from water transportation, rather than on account of their perishable character. But it is a well-known fact that water-borne traffic under ordinary circumstances is transported cheaper than by rail, and, consequently, a large part of the traffic between the North and the South is carried by water in vessels operating between the several seaports on the coast, and this service is largely augmented by rail connections from these seaport cities to interior points.

The system of water transportation between the ports on the Atlantic coast north and south of Cape Hatteras and Diamond shoals has been practically confined to steamships and large sailing vessels, owing to the dangers incident to the passing of that famous wreckage point. It is a fact that Hatteras is the most dangerous point on the Atlantic coast, and that a large number of vessels attempting to pass this point are wrecked every year. Quoting from a recent article in the Manufacturers' Record on this subject, the statement is made "that 17 per cent of the vessels trading along the coast are wrecked at this point. Not only is it dangerous to life and property, but it is also a point of detention owing to the combating winds that prevail. It is self-evident, therefore, that if a suitable route could be obtained inland, this menace to life and property could be avoided and the advantages of every mode of transportation by water could be availed of."

The opening of a new route for traffic between the North and South by an inland waterway solves the problem of providing a water route which avoids the dangers of Cape Hatteras, and which further enables the cheapest known form of water transportation to be utilized, viz, small sailing vessels and barges.

The successful culmination of this project may be regarded as a supplemental rather than a competitive transportation route to the rail lines and steamship or large sailing vessel, the barge system being particularly adapted to the handling of bulky cargo, the most notable existing examples of the use of barges being in the shipment of lumber and grain on the Great Lakes and of coal upon the North Atlantic coast.

The phenomenal industrial development of the United States in recent years has largely contributed to increased railroad construction, equipment, and improvement, but the demand for rail transportation facilities outstripped the supply, and the congestion of freight traffic has been notable at frequent intervals. This has been noticeable in the sections of the country which are industrially most developed and where the railroad service is considered to be most advanced, viz, the trunk line and central traffic territory, extending from the Atlantic coast to Chicago and St. Louis.

RESOURCES OF THE SOUTH.

The development of the South is advancing in a marked degree, and the greatest of its achievements industrially and commercially are in the future.

The Monthly Summary of Commerce and Finance of the United States for November, 1900, contained an article by Professor Hargrove, president of the Southern Industrial Convention, from which the following extract is taken, indicating the South's possibilities:

"Of the world's area the United States represents 7 per cent, and of the world's population she represents only 5 per cent.

"The United States produces 80 per cent of the world's cotton, 80 per cent of its cotton seed, 80 per cent of its corn, 30 per cent of its grain, 25 per cent of its wheat, 30 per cent of its meat, 30 per cent of its iron, 40 per cent of its steel, 40 per cent of its mineral products, 33 per cent of its coal, 20 per cent of its salt, and 10 per cent of its wool.

"She has 30 per cent of the railway capital and furnishes the cheapest railway tonnage of the world, carrying a ton of freight 100 miles for 82 cents.

"Government, climate, soil, mine, forest, fisheries, food, and lumber resources picked from the other 93 per cent of the world's surface could not equal us in natural attractions. Our national position, being thus outlined as a world power, it would be opportune to consider our southern sectional ratio to this imposing array of resources and attractions. There are material overmastering facts of the South's natural resources which must be studied to impress us with our happy position for the future.

"I estimate the native raw material of the South as a cash resource this season as follows:

Cotton	$500, 000, 000
Corn	150, 000, 000
Staves	15, 000, 000
Hog products	80, 000, 000
Wheat	55, 000, 000
Poultry and vegetables	55, 000, 000
Pig iron	45, 000, 000
Fruit, melons, etc	60, 000, 000
Coal	50, 000, 000
Live stock and dairy	50, 000, 000
Sugar	50, 000, 000
Oats	20, 000, 000
Hay	25, 000, 000
Fisheries	25, 000, 000
Tobacco	25, 000, 000
Coke	10, 000, 000
Wool	15, 000, 000
Potatoes	15, 000, 000
Peanuts	6, 000, 000
Pine lumber	100, 000, 000
Hard-wood lumber	25, 000, 000
Cypress	10, 000, 000
Cotton seed	45, 000, 000
Phosphate	20, 000, 000
Turpentine and rosin	21, 000, 000
Lead and zinc	30, 000, 000
Oranges	5, 000, 000
Rice	5, 000, 000
Total	1, 512, 000, 000

"Besides this large amount there are annual incomes from many minerals, horses, mules, hides, tallow, beeswax, marble, building stone, clays, oils, lime, cement, rock, nuts, honey, and wild game, representing possibly another $500,000,000 worth of the native resources. Cotton and seed, the South's main resources, are this year the largest single item of raw material in the world.

"The South has 25 per cent of the area of the United States, 33 per cent of its population, all of its cotton and cotton seed, 80 per cent of its tobacco, 65 per cent of its timber resources, 30 per cent of its coal area, 20 per cent of its coal production, 17½ per cent of its iron production, 30 per cent of its railroad mileage, but only 20 per cent of its wealth and less than 10 per cent of its manufacturing.

"Per capita and per area we have greater natural resources in variety, quality, and quantity than any other part of our country, and yet we have only 20 per cent of its wealth and 10 per cent of its manufacturing."

This brief summary and résumé of the South's resources is reflected in the evolution of the transportation facilities in that section. Railroad construction has gone forward at a rapid pace, and, as was the case in the trunk line and central traffic territory, isolated or connecting lines were consolidated until we have a few through or trunk-line systems traversing all or a large part of the southern tier of States. It is to be noted that, in addition to the evolution of through lines north and south, all of these systems have sought lines to the several ports bordering on the coast for the purpose of export and import traffic in connection with water-borne commerce, thus distinctly recognizing the tendency of certain kinds of freight to seek water shipment owing to their bulk or the expense of a long rail haul.

The Seaboard, the Atlantic Coast Line, and the Southern Railway may be cited as notable examples of this fact. Hence the assertion previously made that this proposed water route in the further development of the South is more likely to act as a supplementary safety valve than a competing line for traffic. As the indicated development of the South progresses, the traffic through the southern ports, which is now comparatively small as compared with the North Atlantic ports, will undoubtedly increase both for foreign and coastwise shipment. Manufactured products will increase, and the rail and steamship lines will find their services in demand for carrying freights of the higher grades, so that the barging of bulky commodities will be a distinct advantage and relief.

TRANSPORTATION BY WATER ROUTES.

A water route with the possibilities of water transportation has frequently been demonstrated to be the cheapest form of transportation, but the system of transportation by barges drawn by steam tug is the cheapest form of water transportation.

Barges and towboats have caused a great reduction of freight rates, and in the case of bulky matter this system has reduced the price considerably more than one-half. For instance, the rate on coal from Baltimore to New England points, when carried only by steamer or sailboats, ran from $3 to $5 per ton. It is now being delivered to these points at from 75 cents to $1.25 per ton.

In considering the economic conditions prevalent in this country one of the safest and most enduring elements of progress is assured if the cost of production can be reduced. The element of freight transportation of raw material and finished products plays an important part in fixing the cost of economic production, consequently the introduction of any form of transportation which permanently tends to reduce freight rates, or maintain them upon a reasonably low scale, is a matter of enduring good to the entire community. While water routes do not offer the same rapid and in all cases safe transportation as the rail lines, the generally cheaper rates by water routes act as a counter-balancing check upon the railroad companies.

In the article previously quoted by Professor Hargrove, the rate per ton per mile for hauling freight was given at 8.2 mills for all the railroads in the United States, which is far less than in Great Britain, France, or Germany. In a report discussing the proposed ship canal between Lake Erie and Pittsburg, the average ton-mile rate on all rail traffic between Pittsburg and Lake Erie was given as 6.7 mills; which was below the ton-mile rate on ore (8.85) and coal 8 mills. The statistical abstract of the United States for 1902, published by the Treasury Department, gives the average railroad receipts in groups of States and for the entire country per ton per mile in mills from which the following is culled:

MIDDLE STATES.

1889	8.1	1896	6.8
1890	7.9	1897	5.8
1891	7.8	1898	6.1
1892	7.6	1899	5.7
1893	7.7	1900	6.1
1894	7.4	1901	6.2
1895	7.1		

SOUTH ATLANTIC STATES.

1889	11	1896	7.6
1890	10.3	1897	7.6
1891	9.7	1898	7.6
1892	9.3	1899	6.8
1893	8.6	1900	6.9
1894	8	1901	7.3
1895	7.9		

UNITED STATES.

1889	9.7	1896	8.2
1890	9.3	1897	8
1891	9.3	1898	7.6
1892	9.4	1899	7.3
1893	8.9	1900	7.5
1894	8.6	1901	7.6
1895	8.4		

A detailed study of the great canals of the world and a discussion of the canal statistics of the St. Marys Falls Canal, which connects lakes Superior and Huron, yields the following cost of carrying per ton-mile in mills:

1887	2.3	1894	0.99
1888	1.5	1895	1.14
1889	1.5	1896	.99
1890	1.3	1897	.83
1891	1.35	1898	.79
1892	1.31	1899	1.05
1893	1.1	1900	1.18

The report continues:

"The volume of traffic through this canal far exceeds that through the Suez Canal. In 1881 the traffic of the old St. Marys Falls Canal was 1,560,000 tons, as against 4,130,000 tons through the Suez Canal, but with the enlargement of the American Canal a rapid increase in traffic immediately developed. By 1889 it equaled that of the Suez Canal (about 7,000,000 tons in each). In 1895 a tonnage of 15,000,000 tons went through the St. Marys Canal, as compared with 8,500,000 tons through the Suez Canal, and in 1901 the figures for the St. Marys Falls Canal were 28,403,065 tons. The present tonnage through the American Canal exceeds the total foreign trade of the port of New York and is equal to nearly half the total volume of the foreign trade of the United States. In value the traffic through St. Marys Falls Canal presents less imposing figures, though even in this respect it is by no means insignificant. The value of the freight passing through the canal in 1896 is estimated at $195,000,000, and in 1901 at $290,000,000."

Owing to the large volume of traffic passing through this canal and its history, extending over a half century, the study of its effect upon commerce is interesting and instructive.

The cheapening effect of water transportation may be further emphasized by the following table, taken from the Statistical Abstract of the United States for 1902, being the freight rates on wheat per bushel by lake, canal, and rail from Chicago to New York by steam:

Calendar year.	By lake and rail.	By all rail.	Lake and canal.
	Cents.	*Cents.*	*Cents.*
1868	29	42.6	22.79
1869	25	35.1	25.12
1870	22	33.3	17.11
1871	25	31	20.24
1872	28	33.5	24.47
1873	26.9	33.2	19.19
1874	16.9	28.7	14.1
1875	14.6	24.1	11.43
1876	11.8	16.5	9.58
1877	15.8	20.3	11.24
1878	11.4	17.7	9.15
1879	13.1	17.3	11.6
1880	15.7	19.9	12.27
1881	10.4	14.4	8.19
1882	10.9	14.6	7.89
1883	11.5	16.5	8.37
1884	9.95	13.125	6.31
1885	9.02	14	5.87
1886	12	16.5	8.71
1887	12	15.74	8.51
1888	11	14.5	5.93
1889	8.7	15	6.89
1890	8.5	14.31	5.85
1891	8.53	15	5.96
1892	7.55	14.23	5.61
1893	8.44	14.7	6.33
1894	7	12.88	4.44
1895	6.95	12.17	4.11
1896	7.32	12	5.38
1897	7.37	12.32	4.35
1898	4.96	11.55	4.42
1899	6.63	11.13	5.65
1900	5.05	9.98	4.42
1901	5.57	9.92	5.14
1902	5.78	10.60	5.25

Maj. Thomas W. Symons, in a very elaborate report published in 1897 upon the proposed improvement of the Erie Canal, reached the conclusion that the most economical plan was the construction of a barge canal for the purpose of using barges similar to the coal-carrying barges of the North Atlantic trade. In comparison with the rates given in the above table he gave the rates for wheat per bushel from Chicago to New York by the Erie Canal as then existing at 5.32 cents, or $1.77 per ton, and by the suggested barge canal at 3.60 cents, or $1.20 per ton, which would be $1\frac{1}{5}$ mills per ton-mile on a mileage of 1,000.

Four of the five largest ports in the United States, through which the bulk of the inbound and outbound traffic pour, are located on the coast north of the proposed inland waterway, between the Chesapeake Bay and Beaufort Inlet, and while there are local conditions which may affect each of these cities, yet it is a reasonably just statement that in the interchange of traffic with the South what is true of one of these as affected by the construction of the inland waterway will be true of the others.

These four cities (New York, Philadelphia, Baltimore, and Boston) are all centers of a numerous population; they are all large centers of distributive business seeking trade relations with the South; they are all large buyers of cotton, lumber, and other Southern products; they are all the centers and the outlets for large manufactories or manufacturing districts.

Our object in setting forth the volume and tonnage of the leading ports on the North Atlantic coast are—

1. To show that the necessities of a large volume of ocean commerce require and lead to the facilities for handling said commerce, and such facilities are mutually advantageous to coastwise commerce.
2. That this evolution is coincident with the development of transportation lines tapping the interior of the country.
3. The development of coastwise traffic is to a considerable extent facilitated through a city like Baltimore by the opportunities offered by extensive rail connections with the interior, and frequent and regular steamship service with foreign countries.
4. The failure to preserve in the several customs districts of the United States complete records of the coastwise commerce and tonnage makes it difficult to obtain accurate information as to the volume of coastwise traffic, and the general information pertaining to population, foreign commerce, and importance of a city as a port, manufacturing and distributive center, furnishes a crude basis to show to some extent its importance in coastwise commerce.

SHIPPING FACILITIES AND ADVANTAGES.

Briefly stated the evolution of Baltimore's water-borne commerce has resulted in bringing about 25 miles of water front and railroad service into the immediate vicinity of the city into readiness for the construction of piers and wharves, and approximately one-third of this water front has been so utilized.

The larger piers are accessible by a channel 30 feet in depth and 600 feet wide; grain elevators with an aggregate capacity of 5,350,000 bushels, and gigantic warehouses for miscellaneous freights and commodities have been erected, and extensive freight yards, sheds, coal piers, and terminals have been constructed on the water front.

This development has been brought about by the Pennsylvania Railroad lines centering in Baltimore, and the Baltimore and Ohio. Further development is now in progress as a result of the transfer of the Western Maryland Railroad to the interests controlling the Wabash, Missouri Pacific, Denver and Rio Grande, and West Virginia Central and Pittsburg Railway. Connecting links are under contract which will result in a through service from all the territory tapped by these several lines, to Baltimore as their Atlantic outlet. Not only will this step, which is expected to be completed within the next two years, add materially to the facilities of Baltimore, but it will increase enormously the tonnage at this port, and lead to the establishment of additional connecting steamship lines.

These facilities are supplemented by regular coastwise steamship service, as follows: Merchants and Miners' Transportation Company to Boston, Providence, and Savannah, Norfolk to Newport News; Chesapeake Steamship Company to Norfolk and Richmond; Baltimore Steam Packet Company to Norfolk; Ericsson Line to Philadelphia; Chester River Steamboat Company, points on Chester River; Baltimore, Chesapeake and Atlantic Railway Company, operating steamer lines to points on Chesapeake Bay and estuaries; Weems Steamboat Company to points on Chesapeake Bay and estuaries in Maryland and Virginia; Queen Anne's Railroad Company operating a rail and steamer line in Maryland and Delaware.

By a large number of "tramp" or specially chartered steamships carrying cargo to designated points, and other regular lines to foreign ports.

By minor railroads centering in Baltimore, as follows: The Maryland and Pennsylvania Railroad extending through central Maryland into southern Pennsylvania; the Baltimore and Annapolis Short Line extending to Annapolis.

By an extensive fleet of small sailing craft handling agricultural products and miscellaneous commodities.

Each of these several means of rail and water transportation offers freight which contributes to the tonnage of the others.

The elements of cost in transshipment from rail to water and vice versa at the port of Baltimore are notably low, and therefore furnish an additional advantage which this port offers. Several of the grain elevators and freight warehouses are erected directly upon the water front, so that cargo can be easily, quickly, and economically transferred. The labor of stevedores is much less than in New York.

Owing to its geographical position and the consequent shorter haul from the interior to tidewater at this city, Baltimore has been accorded a differential in rates as compared with rates to Philadelphia and New York.

The location of Baltimore midway between North and South on the Atlantic coast gives it a wide range of the interior North, West, and South from which to draw traffic. This range of country is traversed by rail lines radiating from Baltimore. To the westward, upon the completion of the Wabash connection, the city will have three trunk lines reaching the rich manufacturing, coke, and coal region around Pittsburg, the bituminous coal mines and timber tracts of western Maryland and West Virginia, and stretching out to the populous cities and industrial centers of the West as well as the great grain belts of the Mississippi Valley.

The development of water-borne coastwise commerce at the port of Baltimore is expressed in statistics contained in the following.

The following figures from the report of the Baltimore Chamber of Commerce for the calendar year 1902 show:

Coastwise, 1902.

Year.	Entered.		Cleared.	
	Number.	Tonnage.	Number.	Tonnage.
1902	1,463	2,077,559	2,128	2,673,319
1901	1,510	2,103,791	2,227	2,644,331

NOTE.—"Under the navigation laws a large percentage of the vessels carrying the American flag are not obliged to enter or clear at the custom-house. The above statement represents about 50 per cent of the coastwise trade."

The conservative character of the estimate made in the aforegoing note is borne out by the following statistics from the report for 1902 of Mr. James R. Horner, municipal statistician of Baltimore:

Coastwise, 1902.

Class.	Entered.		Cleared.	
	Number.	Tons.	Number.	Tons.
Steam	3,755	3,874,129	4,068	4,270,711
Sail	9,493	1,356,944	5,412	1,646,352
Total	13,248	5,231,073	9,480	5,917,063

The coastwise traffic of this port, which is approximately three times greater than the foreign tonnage, is exhibited below:

Coastwise, calendar year 1902.

	Tons.
Entered	5,231,073
Cleared	5,917,063

The foreign tonnage at Baltimore in 1902 was below the average, owing to the railroad congestion and condition of the grain crops. In undertaking to ascertain the character and value of the commodities constituting the coastwise commerce of Baltimore, considerable difficulty is encountered owing to the conditions governing this traffic, which is of large volume, and any analysis of the question is very complicated. As compared with New York and Philadelphia, the number of coastwise arrivals at Baltimore in 1902 was 13,248, against 7,957 for New York and 3,749 for Philadelphia. Of the total number of vessels and tonnage entered and cleared at Baltimore, as given in the above table, the number and tonnage officially entered and cleared at the custom-house in compliance with Government regulations were:

Entered:	
Number of vessels	1,263
Tonnage	2,077,962
Cleared:	
Number of vessels	2,123
Tonnage	2,673,319

The additional vessels and tonnage arrived at Baltimore, as shown in the table but not legally required to enter, have been ascertained by reports of city officials to the municipal statistician. Through this channel information has been obtained for the following table, which indicates something of the character of the coastwise commerce of Baltimore:

Vessels arrived during the year 1902. (*Coastwise.*)

[Not entered at custom-house.]

Class.	Number.	Cargo.	Quantity.	Tonnage.
Sail	45	Phosphate rock....tons	69,617	42,817
Do	857	Lumber....feet	123,339,940	157,787
Do	747	Light		554,951
Do	4	Salt....tons	1,000	788
Do	14	Fertilizers....do	7,541	4,015
Do	35	Ice....do	45,860	27,576
Do	7	Ballast		5,831
Do	1	In transit		1,382
Do	1,585	Oysters....bushels	1,604,798	28,237
Do	3	Onions....do	1,275	
Do	17	Cement....barrels	31,397	3,703
Do	22	Hay....tons	384	673
Do	13	Junk....do	63	132
Do	2	Flour....barrels	114	451
Do	925	Grain		19,555
Do	106	Fish....barrels	4,092	2,595
Do	1	Straw		34
Do	9	Shingles....number	3,104,050	1,345
Do	4	Laths....do	694,382	456
Do	1	Matting		1,200
Do	11	Tobacco		301
Do	1	Oranges....boxes	364	
Do	396	Cord wood....cords	23,722	14,322
Do	14	Steel rails....tons	12,975	4,550
Do	6	Dogwood....cords	76	248
Do	3	Manure		92
Do	4	Dirt		73
Do	21	Scrap iron....tons	63	307
Do	1	Logs....number		24
Do	11	Posts....do	130,020	489
Do	99	Corn....bushels	156,400	5,938
Do	1	Lime....barrels	50	
Do	5	Coal....tons	5,728	3,533
Do	7	Naphtha....gallons	4,888,000	7,920
Do	4	Railroad ties....number	357,029	3,497
Do	2	General merchandise		173
Do	38	Pig iron....tons	1,990	786
Do	405	Strawberries....crates	53,196	6,725
Do	65	Laths....number Lumber....feet Shingles....number	6,285,321 110,000 38,950	8,989
Do	305	Peas....tons	58,511	5,085
Do	17	Clams		136
Do	1	Plaster....barrels	700	163
Do	72	Potatoes....bushels	7,272	1,012
Do	116	Cabbage....tons	273,000	1,104
Do	2,430	Produce....bushels	1,153,934	41,721
Do	1	Spars....number	1,300	124
Do	6	Cantaloupes....baskets	1,115	87
Do	311	Watermelons....number	386,250	4,993
Do	6	Fish scrap....tons	3,017	1,982
Do	1	Iron pyrites....do	1,064	175
Do	28	Tomatoes....baskets	8,697	466
Do	2	Bricks....number	14,000	220
Do	6	Tankage....tons	4,550	1,596

Vessels arrived during the year 1902. (Coastwise.)—Continued.

Class.	Number.	Cargo.	Quantity.	Tonnage.
Sail	1	Clover seed ... bags	100	10
Do	4	Railroad iron ... tons	2,689	1,657
Do	1	Demijohns ... number	2,995	....
Do	2	Kainit ... tons	1,370	726
Do	1	Asphalt ... do	1,480	873
Do	2	Fertilizer salt ... do	1,100	411
Do	2	Oil ... gallons	1,900,000	2,427
Do	2	Guano ... tons	1,745	1,079
Do	1	Lead	....	17
Steam	1,869	General merchandise ... packages	1,750,150	1,545,771
Do	79	Ballast	....	130,511
Do	17	In transit	....	39,078
Do	21	Light	....	20,104
Do	5	Phosphate rock ... tons	12,350	6,279
Do	146	Grain	....	14,889
Do	7	Lumber ... feet	4,490,000	8,096
Do	1	Molding sand ... tons	450	170
Sail	6	Cement ... do	3,775	2,033
Do	3	Fertilizers ... do	1,319	638
Do	1	Naphtha ... gallons	575,000	1,310
Do	3	Canned goods ... cases	36,200	1,304
Do	1	Vinegar ... barrels Guano ... tons	50 800	525
Do	3	... do ... do	3,700	1,624
Do	3	Nitrate of soda ... do	795	1,158
Do	1	Paraffin ... barrels	5,600	589
Do	1	Acid fertilizer ... tons Kainit ... do Nitrate soda ... do Nitrate potash ... do	134 89 6 35	178
Do	1	In transit	....	2,492
Do	448	Miscellaneous	....	36,246
Steam	1,134	General merchandise ... packages	2,265,085	1,057,063
Do	137	Ballast	....	251,357
Do	27	Coal ... tons	44,346	25,997
Do	18	In transit	....	53,912
Do	2	Steel rails ... tons	11,051	10,792
Do	53	Light	....	2,837
Do	1	Miscellaneous	....	369,212
Sail	586	Coal ... tons	940,698	590,952
Do	3	Salt ... do	1,225	396
Do	2	Corn ... bushels	32,650	858
Do	3	Shells ... tons	3,180	938
Do	15	Ballast	....	25,674
Do	15	Steel rails ... tons	21,266	14,262
Do	36	Light	....	28,133
Do	2,972	General merchandise	....	154,731
Do	11	Oil ... barrels	17,925	8,646
Do	8	Kainit ... tons	2,309	1,636
Do	1	Fire brick	....	163
Total	6,186	....	....	2,651,277

It is much to be regretted that, for the purpose of this report, the above tables do not show the entire quantities of commodities carried coastwise, with their values, in order that the question under consideration could be reviewed with the greatest accuracy as to the traffic affected. In the absence of such complete information, certain inferences, which may be considered reasonably correct, may be drawn from an examination of the statistics now in hand.

The character of the commodities enumerated indicates that a large part of the tonnage noted originates in the waters, on the shores and tributaries of the Chesapeake Bay, being oysters, fish, fruits, vegetables, and other products of this rich truck farming and agricultural section. In passing it may be noted that the improvement of the inland water connection between the Chesapeake Bay and the North Carolina sounds, and making the same free, will afford the truck farmers of eastern North Carolina and Virginia more accessible markets in Norfolk, Washington, Philadelphia, and New York, and will practically widen the productive area surrounding the Chesapeake Bay to include eastern North Carolina. A large part of the Chesapeake Bay traffic is handled in small sailing vessels ranging from 10 to 50 tons. Another large element of this traffic is the general merchandise which is distributed through most of this area by regular steamer lines.

Passing over this large volume of Chesapeake Bay business, the two remaining elements that are pertinent to this question under discussion are the coastwise business north and south of the Chesapeake Bay. In the absence of complete data as to the coastwise shipments, the following statement of commodities received at and shipped from Baltimore during the year 1902, coastwise, State, and interstate—that is, by rail and water—is given, and from this list certain commodities, which by their nature indicate that their production is in the South, may be selected as a basis for estimating the Southern traffic available for water transportation.

Received at and shipped from Baltimore during the year 1902.

[Coastwise, State, and Interstate.]

Articles.	Shipments.	Receipts.
Cotton.........bales..	95,000	233,806
Lumber.........feet..	359,395,672	409,067,672
Tobacco.........hogsheads..	32,717	55,078
Canned goods.........cases..	1,242,227	309,087
Fertilizers.........tons..	272,589	26,715
Oysters, fish, and clams.........do....	163	5,683
Fruits and vegetables.........do....	4,144	9,799
Textiles.........do....	232,291	4,780
Wool, raw.........do....	1,063	859
Wines, liquors, and beer.........do....	12,485	14,006
Sheep.........number..	3,096	389,340
Cattle.........do....	609	205,649
Horses and mules.........do....	1,434	7,391
Hogs.........do....	....	589,126
Calves.........do....	....	22,597
Coal:		
Anthracite.........tons..	112,688	257,654
Bituminous.........do....	1,144,088	1,619,330
Coke.........do....	364	154,878
Wheat.........bushels..	9,114,532	11,705,456
Corn.........do....	3,992,447	7,344,934
Oats.........do....	140,281	3,079,465
Rye.........do....	1,258,030	2,086,341
Barley.........do....	....	172,955
Malt.........do....	....	641,496
Corn products.........barrels..	9,691	140,179
Hay.........tons..	11,664	55,947
Straw.........do....	371	3,271
Mill feed.........do....	1,520	15,170
Flour.........barrels..	77,068	4,153,271
Cement, bricks, and lime.........tons..	31,000	61,532
Iron:		
Pig and bloom.........do....	17,342	34,783
Manufactured.........do....	3,770	1,711
Iron and steel rails.........do....	151,633	16,917
Bar and sheet metal.........do....	18,671	21,352
Household goods and furniture.........	9,226	3,739
Petroleum and other oils.........tons..	92,112	22,229
Ice.........do....	....	45,860
Shingles.........number..	35,800	3,139,050
Phosphate rock.........tons..	....	94,627
Sugar.........do....	7,181	35,584
Liquor in glass.........cases..	1,169	....
Fruit cans.........pounds..	1,078,556	....
Iron pipe.........do....	162,270	....
Trees.........do....	35,000	....
Bran.........do....	1,961,930	....
Powder.........do....	117,450	....
Sirup.........do....	44,200	....
Copper.........tons..	803	....
Terra-cotta pipe.........pounds..	436,000	....
Street dirt.........do....	383,370	....
Angle plates.........bundles..	4,228	....
Shells.........tons..	1,800	....
Nitrate soda.........do....	468	....
Paraffin.........barrels..	5,600	....
Manure.........pounds..	244,350	....
Cord wood.........cords..	....	....
Poultry, game, and fish.........tons..	2,092	36,746
Hides and leather.........do....	4,016	3,230
General merchandise.........do....	639,916	3,498
Naval stores.........do....	4,779	1,193,123
Dressed meats.........do....	3,522	10,139
Ores.........do....	19,765	13,116
Stone, sand, etc.........do....	44,147	2,660
Other castings and machinery.........do....	58,349	209,190
Other packing-house products.........do....	14,384	69,427
Agricultural implements.........do....	461	20,696
Wagons, carriages, and tools.........	1,064	1,938

Received at and shipped from Baltimore during the year 1902—Continued.

Articles.	Shipments.	Receipts.
Tobacco, manufactured...pounds	1,824,114	3,279
Posts...number		3,697,739
Boots and shoes...tons	34,309	129,620
Coffee...pounds	2,454,809	49
Naphtha...gallons	575,000	4,880,000
Produce...baskets		1,128,337
Potatoes...bushels	2,722	59,870
Salt...tons	1,248	1,030
Scrap iron...do	101	3,460
Oysters...bushels		1,689,604
Dried apples...pounds		45,600
Cotton-seed meal...do		380,100
Sumach...do		20,000
Cotton sweeping...do		8,050
Telegraph poles...number		900,100
Chain...tons		171
Onions...pounds		300,420
Junk...tons		63
Steel...do		11
Dogwood...cords		76
Laths...number		694,382
Nails...pounds	37,705	57,428
Railroad ties...number		257,029
Plaster...barrels		700
Peas...bags		57,347
Strawberries...crates	103,176	122,817
Cabbage...heads		273,000
Tankage...tons		4,550
Melons...number		386,250
Fish scrap...tons		2,278
Iron pyrites...do		1,064
Cantaloupes...baskets		1,115
Tomatoes...do		176,130
Fruits...packages	100	27,404
Old iron...tons		2,694
Clover seed...bags		100
Oysters...barrels		500
Molding sand...tons		450
Peaches...packages		283,844
Demijohns...number		2,995
Kainit...tons	2,377	1,370
Asphalt...do		1,480
Fertilizer salt...do		1,100
Guano...do	3,700	1,746
Pears and apples...packages		9,989
Fish...barrels		500
Chemicals...tons		14

Distinctively or largely Southern commodities received at Baltimore during the year 1902.

Coastwise, State, and interstate.

Articles.	Receipts.
Cotton...bales	233,806
Tobacco...hogsheads	55,078
Lumber...feet	409,067,672
Fertilizers...tons	26,715
Phosphate rock...do	94,627
Sugar...do	35,584
Tobacco, manufactured...pounds	3,697,739
Cotton-seed meal...do	380,100
Railroad ties...number	257,029
Naval stores...tons	10,139
Telegraph poles...number	900,100

This tabulation is, of course, far from including all the forms of traffic that originate in the South and find their market in Baltimore, nor is it asserted that all of these commodities find their way to Baltimore by water, but for the purpose of analysis it may be allowed that the tonnage of southern origin not included will offset any tonnage in the table that does not reach Baltimore by water.

Reducing this tonnage given in the table to hundredweight and applying the established freight rates for the respective articles from Brunswick, Ga., to Baltimore, this being taken as a uniform basis for the purpose of the calculation, we obtain the following results:

Articles.	Hundred-weight.	Freight charged.
Cotton	1,169,030	$397,470.20
Tobacco	550,780	187,265.20
Lumber	12,272,010	2,147,604.00
Fertilizers	534,300	125,560.50
Phosphate rock	1,892,540	444,746.90
Sugar	711,680	199,270.40
Tobacco, manufactured	36,977	22,555.00
Cotton-seed meal	3,801	893.23
Railroad ties	277,590	49,539.17
Naval stores	202,780	47,653.30
Telegraph poles	3,937,500	864,000.00
Total	[a]21,588,988	4,486,557.90

[a] 1,079,449 tons.

Making the average rate 20.7 cents or 0.55 of a cent per ton per mile for a distance estimated at 750 miles. This is slightly under the average rate per ton per mile for traffic in the South Atlantic States.

The tabulation deals only with north-bound commerce, for from the nature of the products listed it is apparent that their movement is north-bound.

Upon the opening of this proposed waterway its utilization for south-bound traffic would probably be much lighter than north-bound, but such articles as coal, fertilizers, cement, canned goods, terra cotta, structural iron, oil, and other commodities would undoubtedly seek transportation at the low rates offered for return cargo. Major Symons, in his admirable report upon the Erie Canal improvement, the discussion of which in many particulars parallels this project, states it was customary to make an estimate of one-third return cargo in the canal traffic.

If this is to be allowed, we have, then—

	Tons.	Freight charged.
North-bound cargo	1,079,449	$4,486,557.90
South-bound cargo	359,816	1,495,519.30
Total	1,439,265	5,982,077.20

As has been previously stated in this report, experience of years upon the Great Lakes and upon the North Atlantic has demonstrated that barging has reduced the cost of transportation, but Major Symons, in the report just referred to, has given the subject such exhaustive examination that he seems to have summed up the entire question. If his deduction concerning a barging system upon the Great Lakes, the improved canal connecting the Lakes and the Hudson River, are correct, they point to the fact that a barge canal would reduce existing rates about 33 per cent. And this estimate is liberally supported by minute calculations and investigations.

The traffic is largely similar in character. A classification of the tonnage of New York canals, published in the November, 1900, Summary of Finance and Commerce, shows the following:

	Tons.
Products of the forest	896,971
Agricultural products	789,783
Manufactures	152,388
Merchandise	250,872
Not classified	1,527,790
Total	3,617,804

It appears from these figures that about one-fourth of the total tonnage of the New York canals was made up of forest products. The analysis of this total shows that 75 per cent of these products consisted of boards, scantling, and timber. If we include wood pulp, these four articles make up 80 per cent of the products of the forest which are carried by canal.

The value of all property carried on these canals during the season of 1897 was $96,063,338—somewhat less that $100,000,000. The forest products carried had a total value of $11,780,232, or nearly one-eighth of the value of the entire canal tonnage.

An examination of the traffic offered on the South Atlantic coast for barge transportation leads to the conclusion that lumber will constitute the largest single item.

Applying the parallel between the proposed barge canal in the State of New York and the barge canal upon the South Atlantic, the reduction of freight charges 33 per cent upon a total payment for freight as indicated of $5,982,077.20 would make a net annual saving of $1,974,085.47 to producer and consumer.

The subject of marine insurance has not been discussed in this report, but the disasters off Cape Hatteras have made marine-insurance rates upon the South Atlantic coast abnormally high, and the establishment of a protective inland route should, upon general principles, reduce the cost of insurance.

The complicated character of the commerce of Baltimore makes it a difficult matter to suggest anything definite concerning the prospective traffic of the city that may utilize an inland waterway to the South. The preliminary part of this report has indicated the tremendous resources undeveloped in the South. From her previous history, trade, and business and social relations with that section, Baltimore can reasonably be expected to participate largely in opening up these resources and sharing in the resulting trade.

Baltimore has gone forward quite rapidly as a manufacturing city, and will undoubtedly increase its manufacturing enterprises.

The city is recognized throughout the East more and more as a distributive center for the Southern States, and the prestige obtained in this respect is influencing the location of numerous agencies for manufactured articles, as well as many manufactories in this city, thus providing an increase in manufactured goods from year to year. These industries require the bringing in of new material of various kinds, and the shipment of finished products.

Much interesting and valuable information about the lumber trade of the South Atlantic States may be found in the November, 1900, Summary of Finance and Commerce of the Treasury Department. The prominence of the lumber industry and its bearing upon the question under consideration are, we believe, sufficient to warrant the request that the possibilities of this trade may be thoroughly examined in connection with the proposed inland water route.

Respectfully submitted.

Clarence H. Forrest,
Secretary Merchants and Manufacturers' Association.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of Board of Engineers having under consideration the project of inland waterway between Norfolk, Va., and Beaufort Inlet, North Carolina.

Exhibit B.

LETTER OF THE NORFOLK (VA.) CHAMBER OF COMMERCE.

August 6, 1903.

Dear Sir: In compliance with a request of Col. Peter C. Hains, formerly of the Corps of Engineers, eastern division, for a detail statistical report outlining as accurately as possible the benefits which it is believed will accrue to this port by the reason of the construction of an inland waterway 16 feet deep and of sufficient width, between Norfolk, in the State of Virginia, and Beaufort Inlet, in the State of North Carolina, I have the honor to submit herewith the same, together with a report from the committee on improvement of Elizabeth River as well as resolution of the board of directors of the Norfolk Chamber of Commerce bearing upon the subject.

I have the honor to be, yours, very truly,

W. R. Mayo, *President.*

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of Board of Engineers having under consideration the project of an inland waterway between Norfolk, Va., and Beaufort Inlet, North Carolina.

At a meeting of the board of directors of the Norfolk Chamber of Commerce held on April 28, 1902, the following report from the committee on improvement of Elizabeth River, Col. William Lamb, chairman, was approved:

NORFOLK, VA., *April 14, 1902.*

GENTLEMEN: We, the committee on improvement of Elizabeth River, after having examined into the question of the proposed inland waterway between Norfolk and Beaufort Inlet, North Carolina, respectfully recommend that the chamber request the Hon. Thos. S. Martin, junior Senator from Virginia and member of the Committee on Commerce in the United States Senate, to obtain from that committee an amendment authorizing the appointment of a Board of Engineers to consider the subject of an inland waterway from Norfolk Harbor, in the State of Virginia, to Beaufort Inlet, in the State of North Carolina, as follows:

"That the Secretary of War is hereby authorized and directed to appoint a Board of Engineers, to consist of not less than three and not more than five, and to be taken from either the active or retired list of engineers in the service of the United States, to consider the entire subject of a waterway of not less than 16-foot depth, from Norfolk Harbor, in the State of Virginia, to Beaufort Inlet, in the State of North Carolina, with instructions: First, to make surveys of all possible routes in connection with both the Albemarle and Chesapeake and Dismal Swamp canals, whether or not included in the recent surveys made by Maj. James B. Quinn and Capt. E. W. Van C. Lucas and reported to Congress in Executive Document No. 202, Fifty-sixth Congress, second session; and, second, to submit a full report and description of all these routes with an estimate of the total cost of the construction of the same with a depth of 16 feet, including the purchase of any existing canal, with the advantages and disadvantages of any these routes, for acquisition by the United States for the purpose of commerce and defense."

Respectfully submitted for the committee.

WM. LAMB, *Chairman.*

PRESIDENT AND BOARD OF DIRECTORS NORFOLK CHAMBER OF COMMERCE.

Further, on November 26, 1902, the following additional report of the committee on improvement of Elizabeth River was adopted by the board of directors of the chamber:

"The Hon. John H. Small having appeared before the committee on improvement of Elizabeth River of the Norfolk Chamber of Commerce and presented the great importance of supplying the proper commercial statistics to the Board of Engineers, with a view of securing the appropriation necessary for the work on the proposed inland waterway, and requesting that some competent person be selected to obtain and tabulate the necessary statistics and data, therefore this committee recommends to the board of directors that they authorize the services of Secretary Lumsden for the purpose of visiting the Southern cities interested and obtaining the necessary data, and that they take the proper steps to secure the funds necessary for the trip."

NORFOLK, VA., *July 31, 1903.*

GENTLEMEN: In compliance with the instructions of your honorable body, I accompanied in April, 1903, Congressman John H. Small, First district, North Carolina, and Mr. C. H. Forrest, secretary Merchants and Manufacturers' Association, Baltimore, Md., to the South Atlantic cities, at which time the matter of an inland waterway was carefully and fully explained to the various commercial organizations at these points, and separate and detailed reports have been compiled by them concerning the benefits which it is expected will be derived by each port. As regards this port, I transmit herewith the result of my personal investigation.

That water-borne transportation is the cheapest form has been so well demonstrated that argument along this line is unnecessary, and of this character the least costly is barge transportation. An inland waterway of the nature described, viz, of a 16-foot depth and of sufficient width, will make barge transportation between the South Atlantic and North Atlantic ports thoroughly practicable, and will result in an immense saving of freight rates on business interchanged between those points. The commerce in bulky merchandise between the Carolinas, southeastern territory and the South Atlantic ports, and the North Atlantic ports and interior eastern points grows daily in volume, and with cheaper transportation the extent of this growth would naturally be much greater and more rapid.

The inland waterway proposed would avoid the dangerous navigation past Cape Hatteras and the Diamond shoals, which has been properly termed "the graveyard of the Atlantic," and would reduce the loss of lives and property to a minimum. The enormity of these dangers can be better appreciated when it is stated that for ten years beginning July 1, 1890, to June 30, 1900, the number of lives lost was 42, the total number of vessels lost 41, and a total property loss amounting to nearly $2,500,000.

The marine insurance by the safer and better-protected channel would be materially reduced; experts in that line figure a general average reduction of from 20 to 25 per cent. The estimate of saving in this direction on the total tonnage of bulky commodities between South Atlantic and North Atlantic ports is difficult to estimate, but should certainly be regarded as a factor in the economical handling of bulky freights between these points.

So far as the ports of Norfolk, Portsmouth, and Newport News are concerned, the greater saving to these ports will be in the matter of business from North and South Carolina, which now moves via either the Dismal Swamp Canal or the Albemarle and Chesapeake Canal, and the prospective increased business from the same territories. I find upon examination that the value of forest products is greatly in excess of that of any other commodity, and is one on which the saving, even on the present movement, would be great. The estimated total tonnage of forest products moving through the two canals for the year 1902 was about 225,000,000 feet in round numbers. The average freight rate is $1.50 per thousand feet, while the toll exacted by the canal companies is 25 cents per thousand feet. Based upon a conservative estimate, the saving in the freight rate would be not less than 50 per cent per thousand feet, while of course it would naturally follow that there would be no toll charge, thereby making an additional saving of 25 cents per thousand feet. Using this estimate, which we are assured by leading lumbermen is a conservative one, the total saving on forest products would be $168,750 per annum.

On coal, of which there was a movement through these canals of about 15,000 tons during the year 1902, the saving would be about 40 cents per ton in freight rates, as well as the saving of the toll charge, viz, 25 cents per ton. This would make a total saving on coal shipments of $9,750 per annum.

General merchandise for the same period between the same territories amounted to about 80,000 tons, upon which it is estimated there would be a saving of not less than $1 per ton, including the toll charge. This would result in the saving of $80,000 per annum on the miscellaneous commodities.

These figures deal with the present movement, and in referring to the movement which it is believed would be created by the waterway as proposed our estimates must necessarily be a matter of speculation. In making these estimates, however, I would call attention to the enormous quantity of forest products, fertilizers, cotton, and cotton-seed products which now move from the territory tapped by the waters of eastern North Carolina via all rail. I speak of this movement with a strong possibility of largely repeating what may appear in the reports of the cities of Wilmington, Newbern, Kinston, Morehead City, Washington, Greenville, Tarboro, Edenton, and Elizabeth City, N. C. It is clearly a fact that the all-rail rates from these cities and adjacent territory are considerably higher than the rate which would be made by small vessel or barge from these points to the larger barge or vessel operating through the proposed inland waterway and thence to the Eastern ports.

I find upon examination of the report on internal commerce for the calendar year 1900 that, according to the report of the officer in charge of the Sault Ste. Marie Canal, the ton-mile rates on the Lakes (which movement I understand to be analogous to this proposed waterway) were in round numbers one-tenth of the ton-mile rates of the railroads of the country. While I do not believe there would be such an enormous difference in the cost of transportation through the territory in eastern Carolina via the route suggested above, yet a conservative estimate would certainly make the proportion via this route, as compared with the all-rail route, at least two-fifths. I am unable to give any detailed figures as to this proposed movement, but basing same upon a conservative estimate of 300,000 tons per annum with a through-freight rate via all rail of $4 per ton, the saving as per this estimate would be $2 per ton, or a total saving of $600,000 per annum.

So far as the commerce between this port and the South Atlantic ports is concerned, I am frank to state that it is of little consequence, practically little or no merchandise being exchanged, and of the heavy commodities almost the entire movement is between the South Atlantic ports and Baltimore, Philadelphia, New York, and Boston. We are therefore unable to indicate any advantage which would accrue on this particular business.

The coal interests at Norfolk and Newport News do some business with the ports of Wilmington, Charleston, Savannah, Brunswick, and Jacksonville. The total present tonnage, however, is not more than 25,000 tons per annum, and the saving on this would not amount to more than $10,000. The ports of Norfolk and Newport News are handicapped in this business by reason of the fact that water transportation from Baltimore and Philadelphia to South Atlantic ports is practically the same as from Norfolk and Newport News. This, together with the fact that the rate from the mines into Baltimore and Philadelphia is lower than from the mines into Norfolk and Newport News, will at once explain this situation. I have it from certain of the coal interests here, however, that if the railroads entering Norfolk and Newport News favor these two ports with a rate equal to that into Baltimore and Philadelphia the business can probably be increased tenfold, and an effort will be made, I am told, to obtain this concession from the Virginia coal-carrying lines. If this be consummated the saving on coal between the Virginia ports and the South Atlantic ports could be reasonably estimated at $100,000 per annum.

To sum up, the total estimated saving will be as follows:

Forest products.—Total present movement 225,000,000 feet per annum, with a present average rate of $1.75 per thousand feet, including toll charge. Average estimated saving, including abolishment of toll, if waterway be constructed, 75 cents per thousand feet, or a total of $168,750 per annum.

Coal.—Total present movement of 16,000 tons per annum. Estimated saving, including toll, 65 cents per ton, or a total estimated saving of $9,750 per annum.

General merchandise.—Total saving, including toll charge, $1 per ton, or a total estimated saving of $80,000 per annum.

Total estimated saving on all commodities, per annum, $258,500.

PROSPECTIVE MOVEMENT.

Estimated saving on business diverted from all rail for movement by proposed inland waterway, 300,000 tons at $2 per ton, $600,000 per annum.

Estimated economy in freight rates on coal between Norfolk and South Atlantic ports via proposed inland waterway and in event of adjustment of rates from the mines to the ports of Norfolk and Newport News, Va., by the Virginia coal-carrying roads, $100,000.

In the foregoing report I have endeavored to be as brief as possible and with a disposition to burden your honorable body with a minimum amount of detail, omitting that which would not be entirely pertinent to the matter in hand. It might not be inappropriate to add further that all of the persons with whom I have conferred with respect to this matter are almost unanimous in the opinion that the proposed inland waterway would be extremely beneficial to the commercial interests in the territory contiguous to and reached from this proposed means of communication, and the project seems to appeal to them as one worthy of earnest consideration by the Board of Engineers of the United States Government and of a reasonable expenditure on its part.

Respectfully,

W. H. Lumsden,
Secretary and Traffic Manager.

The Board of Directors Norfolk Chamber of Commerce.

Exhibit C.

LETTER FROM THE WILMINGTON (N. C.) CHAMBER OF COMMERCE.

April 16, 1903.

Dear Sir: At a meeting of the Chamber of Commerce held this day (7th April) the plan to open an inland waterway from Chesapeake Bay to the Atlantic Ocean at Beaufort Inlet, in North Carolina, was brought before the meeting by Mr. William W. Worth, chairman of our committee on harbor, shipping, and commerce, and very freely discussed, and received the unanimous indorsement of the chamber. It was concluded by all that such an inland waterway would in a great many ways benefit this port. It would open to us an enormous territory, fully 200 miles of sounds, besides the wide territory to be reached therefrom by using the rivers flowing therein, constituting hundreds of miles, which we can not now reach. It would from the very nature of things result in the establishing of barging, the cheapest known method of transportation, barging from this port outside to Beaufort Inlet being perfectly practicable and safe at any season of the year.

This city and immediate vicinity consumes annually 60,000 to 75,000 tons of bituminous coal. Barging from Chesapeake Bay would enable us to land this coal 60 cents per ton cheaper than now obtainable, causing a saving thereby of $45,000 annually, which result would largely increase its use. We ship by water annually 75,000,000 feet of lumber, poles, ties, and piling; the present rate to Baltimore is $4.25 per thousand; by barging this lumber and timber could be landed in Baltimore and other Chesapeake Bay markets $1.75 per thousand cheaper, thereby causing a saving of $131,000 annually in handling of wood products alone. We handle annually of canned goods, lime, cement, and heavy groceries in value about $6,000,000. These goods would naturally seek the route offering the cheapest rate of transportation and would be the principal cargo coming this way, and on which we could reasonably expect a saving of about $100,000.

By this waterway we would avoid the dangers of capes Lookout and Hatteras, thereby lessening the rate of insurance and reduce to a minimum time in water transportation, as vessels would not be forced to wait favorable weather to get around Hatteras. We are confident the opening of this waterway would result in the establishing of new enterprises and industries in our immediate vicinity and the enlarging of some we now have. As the making or unmaking of the centers of trade is now dependent largely upon the rates of freight, it was the unanimous opinion that the opening of this waterway could but result in benefiting our immediate commerce in every way, which now exceeds in volume $50,000,000 annually. The aggregate of saving on inward and outward freight, which would directly accrue to us by reason of the construction of this canal and waterway, would be $276,000 annually and of immense benefit indirectly.

Our total domestic tonnage for 1902 was 295,897 tons.

Yours, very truly,

WM. E. WORTH,
J. A. TAYLOR,
JNO. A. ARRINGDALE,
Special Committee Wilmington Chamber of Commerce.

COL. CHARLES J. ALLEN, *Corps of Engineers, U. S. Army,*
President of Board of Engineers having under consideration the project of an inland waterway between Norfolk, Va., and Beaufort Inlet, North Carolina.

EXHIBIT D.

LETTER OF THE GEORGETOWN (S. C.) BOARD OF TRADE.

MAY 21, 1903.

DEAR SIR: I have the honor to transmit herewith, for your information, the report of the special committee of the Georgetown Board of Trade appointed for the purpose of compiling data showing the advantages and probable pecuniary benefits likely to accrue to the port of Georgetown, S. C., from the establishment of the inland waterway above mentioned, which I hope will be of some service to you in your consideration of this interesting and important subject.

Yours respectfully,

WALTER HAZARD, *President.*

COL. CHARLES J. ALLEN, *Corps of Engineers, U. S. Army,*
President of Board of Engineers having under consideration the project of an inland waterway between Norfolk, Va., and Beaufort Inlet, North Carolina.

REPORT OF COMMITTEE.

GEORGETOWN, S. C., *May 20, 1903.*

GENTLEMEN: The undersigned committee of the Board of Trade, appointed for the purpose of collecting data and statistics showing the commercial advantages which may be expected to accrue to the port of Georgetown, S. C., from the establishment of an inland waterway connecting the waters of Chesapeake Bay with those of Beaufort Inlet, North Carolina, would respectfully submit the following facts and figures, which have been carefully collected from reliable sources and collated by the committee.

PRESENT COMMERCE.

We find upon investigation that the commerce of our port for the year 1902 was as follows:

Items.	Quantity.	Tons.	Value.
OUTWARD.			
Cotton .... bales..	13,242	3,300	$596,890
Clean rice .... barrels..	30,000	4,500	360,000
Rosin, pitch, and tar .... do....	59,738	9,000	119,476
Spirits turpentine .... casks..	9,483	1,900	236,075
Lumber .... feet..	125,803,709	189,000	2,012,859
Laths .... number..	2,739,700	31,100	5,579
Shingles .... do....	5,444,608	4,100	12,893
Cross-ties .... do....	322,601	2,300	112,910
Cord wood .... cords..	300	750	1,000
Cotton seed .... bags..	20,258	....	15,000
Canned goods and pickles	....	180	18,000
Fish and game	....	400	160,000
Wool, hides, and furs	....	50	10,000
Miscellaneous	....	2,500	50,000
Grain, machinery, coal, general merchandise, fertilizers, and manufactured products	....	80,000	1,600,000
Total	....	329,080	5,310,682
INWARD.			
General merchandise, machinery, fertilizers, grain, timber, etc..	....	200,000	4,000,000
Grand total	....	529,080	9,310,682

The percentage of exports which goes to foreign ports is so small that, for all practical purposes, the whole may be included in the category of coastwise trade, while the shipments by railroad consist almost entirely of products which would probably, in the event of the inauguration of an inland waterway, seek the advantages of that route to northern and eastern points, and, for this reason, may likewise be classed as coastwise shipments.

The actual tonnage of this commerce for the year 1902 was 500,000 tons. This includes shipments by river to inland points estimated at 80,000 tons. Of this amount the items which may be properly classified as coastwise shipments to and from northern points, consisting principally of cotton, rice, naval stores, lumber, cross-ties, laths, shingles, machinery, manufactured products, and general merchandise, aggregate about 400,000 tons.

The items of this coastwise trade, the movement of which could be best and most profitably conducted by barge transportation, are cotton, rice, naval stores, lumber, cross-ties, laths, shingles, and machinery, and a portion of the manufactured products, fertilizers, and general merchandise, with an aggregate tonnage of about 300,000 tons.

The existing freight rates by sailing vessel on coastwise shipments from Georgetown to northern ports are as follows:

To New York and Philadelphia:	
Lumber, per thousand	$4.50
Shingles, per thousand	2.25
Cross-ties, each	.15
Laths, per thousand	1.15
Cotton, per bale	1.25
Rice, per barrel	.50
Rosin, per 100 pounds	.10
Spirits of turpentine, per barrel	.65
Coal, per ton	1.25
Cord wood, per cord	4.50
Pine straw, per ton	4.50
To Boston:	
Lumber, per thousand	4.75
Cross-ties, each	.17
To Baltimore:	
Laths, per thousand	.80
To Norfolk and Philadelphia:	
Coal, per ton	1.00

The Atlantic Coast Lumber Company has secured, by contract with a corporation operating a line of steel screw steamers built especially for this trade, special rates on lumber of $2.75 to Baltimore and Philadelphia, $3.50 to New York, and $3.75 to Boston, but, as these rates are due to special conditions and do not represent the cost of transportation in the absence of such exceptional facilities and the advantages accruing therefrom, we are of the opinion that in any accurate estimate of the expense of carrying bulky products from this port to northern points, which is to be used as a basis for calculating the probable reduction in freight rates that might be expected to result from the use of barges by the inland water routes, the prevailing schooner rates should be adopted as the standard of comparison. But insomuch as the Atlantic Coast Lumber Company (as shown by its communication hereto attached as an exhibit to this report) estimates the probable saving on its shipments, as compared with its present special rates, at 50 per cent, we have accepted these rates as the basis of our calculation. In view, however, of the fact that this company is compelled to lighter a large part of its lumber from its steamers at the points of destination at an expense which may safely be taken to be 50 cents per thousand feet on its entire output we deem it proper to add this cost to the special freight rate which it enjoys, which increases the total present cost of transportation on its lumber to about $4 per thousand on New York shipments. This is 50 cents per thousand less than the schooner rates.

It may be stated here that, as most of our coastwise exports go to New York, we have selected the rates to that port as the proper standard for purposes of comparison.

If the total coastwise shipments of this port, both inward and outward, are reduced to tonnage and the existing freight rates thereon are calculated upon the tonnage basis, we will have the following table showing the present actual rates of freight per ton on bulky products likely to be affected by the introduction of barge transportation, together with the probable reduction in said rates which may be anticipated. In arriving at this result we assume that the percentage of reduction will average 50 per cent on all classes of shipments.

Product.	Present rate per ton.	Reduced rate.
Cotton	$5.00	$2.50
Rice	2.86	1.43
Rosin	2.00	1.00
Spirits turpentine	2.60	1.30
Lumber	2.67	1.33½
Laths	2.87	1.43½
Cross-ties	2.10	1.05
Shingles	3.00	1.50
Miscellaneous	3.00	1.50

Applying these figures to the volume of our present coastwise commerce, we are led to the conclusion that the actual saving in money upon the same, by virtue of the reduced expense of transportation, will be as follows:

Product.	Present cost.	Reduced cost.
Cotton	$16,500	$8,250
Rice	12,870	6,435
Rosin	18,000	9,000
Spirits turpentine	4,940	2,470
Lumber	504,630	252,315
Laths	3,157	1,578
Cross-ties	4,830	2,415
Shingles	12,300	6,150
Miscellaneous	243,900	121,950
Total	821,127	410,563

NEW COMMERCE.

In this branch of your inquiry it is difficult to make any accurate forecast as to the extent and manner in which the coastwise trade of our port would probably be increased and promoted by the construction of the waterway and the consequent cheaper freight rates. An intelligent answer to this question would require great expertness and skill, combined with a full knowledge of commercial and traffic matters, as well as an intimate acquaintance with the volume and character of the natural and manufactured products of the territory tributary to Georgetown. Your committee has not been able, in the limited time at its disposal, to obtain and compile anything like complete data on these points, and it has been compelled, therefore, to predicate its conclusions to a great extent upon its general knowledge of the surrounding conditions.

The area traversed by the vast water system centering at Georgetown, composed of over 1,000 miles of navigable streams, watering two-thirds of the State of South Carolina and a considerable portion of North Carolina, embraces some of the richest and most fertile cotton and grain-producing sections of the State, as well as vast bodies of heavily timbered lands and swamps, thickly studded with a great variety and almost inexhaustible supply of valuable woods. It also includes the seats of a constantly and rapidly increasing number of manufacturing and industrial enterprises, such as lumber mills, chemical factories, spoke and hub factories, cotton-seed oil mills, cotton mills, canneries, sash; door, and blind factories, carriage and wagon factories, and others. It is naturally to be supposed that a large part of the products of these various establishments would seek an outlet at Georgetown for distribution to the markets of the world if cheap freight rates on coastwise shipments could be offered as an inducement. But, of course, the extent to which this advantage would operate as a determining factor in attracting commerce to this port must be largely conjectural, even if we were in possession of the actual data showing the present and probable future volume of the total output from these sources, for the reason that it would be impossible to predict what proportion thereof might be directed to other points by local conditions or by favorable railroad rates or by future business and trade conditions.

While we feel safe, therefore, in declaring, in a general way, our judgment that the shipments by rail and water from the interior to this point would be multiplied several fold in the immediate future as a result of the projected improvement in transportation facilities for coastwise exports, yet we are unable to present in detail the figures which would demonstrate conclusively the correctness of this opinion.

In the matter of timber and cross-ties alone your committee feels assured that a marked increase of receipts would quickly ensue. There is every reason, also, to believe that the receipts of raw cotton, which now amount to 13,242 bales per annum, would soon aggregate eight or ten times that quantity.

In this connection we would refer to the attached letters from Mr. E. M. Mathewes, of the Darlington Manufacturing Company, and Mr. Bright Williamson, president of the Bank of Darlington, S. C. The letter of Mr. Mathewes shows that his company is now shipping to New York and other eastern markets about 200,000 pounds (equal to 100 tons) of cotton goods monthly, and that the present freight rate on these goods to New York is 48 cents per hundred pounds, or $9.60 per ton. In view of the assured reduction in freight rates on other products, such as lumber and naval stores, which may be confidently anticipated from the inland waterway, there is no reason apparent to us why a similar proportionate saving should not accrue on cotton goods. If this is true, it would mean a saving to the Darlington Manufacturing Company alone of not less than $5,760 per annum in the cost of delivering its goods in the eastern markets. This, it will be observed, is the benefit to be reaped by a single establishment. The enormous expansion in the cotton manufacturing industry which has taken place of late years and is still going on in South Carolina, notably in Darlington, Florence, Marion, Chesterfield, Sumter, and Kershaw counties, as well as in the city of Columbia and in the counties lying immediately north and west of that city, affords ample room for the conviction that this item of saving would be multiplied many times upon the shipments from these sources. We make no allusion here to the mill industry in the Piedmont region of the State because the effect upon shipments from that source is too remote and conjectural at present to afford a practical basis of comparison.

It is well known that the cotton mills of Columbia, which now constitute one of the largest aggregations of manufacturing enterprises of the most approved equipment in the South, have for a year past been maturing plans for securing an outlet for their products via Charleston or Georgetown The Congaree and Santee rivers furnish the means of cheap and quick transportation from Columbia to Georgetown. It may, we think, be reasonably presumed that its greater proximity to these factories, by securing cheaper and speedier transportation from the mills to tidewater, would cause by far the larger proportion of these shipments to seek Georgetown as a convenient and profitable station for distribution and reshipment to Northern and Eastern points. From our general knowledge of the conditions we are induced to adopt the opinion, therefore, that in the item of cotton manufactures alone the port of Georgetown would derive an increased commerce, aggregating probably 15,000 tons per annum, and that the reduction in freight rates on this class of shipments, based upon a comparison of present and probable future cost of transportation by barge, would amount to at least $72,000 per annum.

The item of raw cotton would presumably show a like but much greater increase in volume and a proportionate reduction in freight charges. The present freight rate on this product from Georgetown to New York, as shown above, is $5 per ton. If the increase in receipts of cotton should be, as we have estimated, 90,000 bales, weighing in round numbers 22,500 tons, the saving in freight on this item would reach the sum of $56,250.

Without further elaboration of detail, we would submit the following table as indicating approximately the amount of increased commerce, inward and outward, which might be expected to be established at Georgetown in consequence of the cheapened coastwise water rates, and the saving in freight thereon between Georgetown and northern ports.

Product.	Quantity.	Saving in freights.
	Tons.	
Raw cotton	22,500	$56,250
Cotton goods	15,000	72,000
Lumber	60,000	79,800
Cross-ties	2,500	2,600
Shingles	4,000	6,000
Naval stores	10,000	12,000
Miscellaneous	5,000	7,500
Inward freights, heavy machinery	75,000	112,500
Total	194,000	348,650

It will be noted that in the foregoing table we have estimated the probable increase in lumber at 33⅓ per cent, in cross-ties at about 100 per cent, in shingles at about 100 per cent, in naval stores at about 100 per cent, in miscellaneous products at about 100 per cent, and in inward freights at about 37½ per cent. It seems to us, also, to be very probable that the largely increased outward shipments would involve a corresponding expansion in imports of manufactured products of all kinds, especially in heavy machinery, mill supplies, coal, and general merchandise.

MARINE INSURANCE.

Under this head we can submit no conclusive figures, for the reason that it is impossible to predict what rates will become operative in the event of the development of safer transportation by the opening of an inland water route, in the absence of any official determination of the matter by the insurance companies, as represented by the several boards and tariff associations by which these rates are regulated. This item does not at present amount to a very great sum, and the prevailing rates for shipments by steam under deck are already so low that it is hardly to be expected that a very material reduction in aggregate cost will be realized on this item. As a matter of percentage, however, it seems that there is good ground for anticipating a considerable saving on all classes of shipments.

One of the leading and most experienced merchants and shippers of Georgetown has given it as his estimate that the inland route would probably result in a reduction on under-deck coastwise vessel shipments from the present average rate to one-fifth of 1 per cent. The present rate for vessel shipments on deck is 4 per cent. A corresponding reduction on this item would mean the substitution of four-fifths of 1 per cent for the present rate of 4 per cent. The average rate of marine insurance on all kinds of products, including both inward and outward freights, is estimated by one of our most experienced ship brokers at 2 per cent. But we have found it impossible to arrive at any satisfactory average rate and have based our calculations upon the rates for the separate classes of articles.

The limited time at our command will not enable us to enter into a minute discussion of this point, or to compile and collate the data so as to afford a basis for an absolutely accurate statement of the aggregate saving in insurance. But we have made an approximate calculation from which we feel justified in estimating the total reduction in actual cost upon the present commerce and the probable increment of shipments of all classes of products at about $31,634 per annum.

The following table shows in detail the process by which we arrive at this result:

	Cost of insurance per annum based on present rates.	Reduced cost on reduced rates.
Present commerce	$30,217	$5,791
New commerce	8,997	1,789
Total	39,214	7,580

Total cost at present rates	$39,214
Total cost at reduced rates	7,580
Total	31,634

RECAPITULATION.

To sum up the general result of your committee's study and investigation of this difficult and complex subject is as follows:

Estimate of total probable saving to the commerce of the port of Georgetown, S. C., from the reduction in freight rates and insurance consequent upon the establishment of the inland waterway:

	Freight rates.	Insurance.
Present commerce	$410,563	$24,426
New commerce	348,650	7,208
Total	759,213	31,634

Saving in freights	$759,213
Saving in insurance	31,634
Total saving	790,847

We append to this report as exhibits letters from Messrs. Fraser & Co. and Maj. B. A. Munnerlyn, insurance agents, upon the question of marine insurance rates.

We also append a letter from Mr. J. I. Hazard, a leading shipping broker and commission merchant, furnishing valuable data as to the prevailing freight rates on coastwise shipments; an interesting and instructive letter from Mr. Freeman S. Farr, president and receiver of the Atlantic Coast Lumber Company, relative to the cheapness of barge transportation, and the great saving to be accomplished thereby, and a letter from the Waccamaw Line of Steamers, D. T. McNeill, superintendent, Conway, S. C., giving rates on naval stores and cotton from that point via Georgetown to New York, and estimating the reduction in rates by the proposed barge transportation at 50 per cent.

All of which is respectfully submitted.

W. D. MORGAN,
FREEMAN S. FARR,
WALTER HAZARD,
Committee.

The OFFICERS AND MEMBERS OF THE BOARD OF TRADE, GEORGETOWN, S. C.

Shipments of lumber from Georgetown, S. C., made by Atlantic Coast Lumber Company during year of 1902.

	Feet.
January	5,426,897
February	7,128,426
March	7,333,510
April	12,747,244
May	10,234,742
June	9,764,851

	Feet.
July	10,496,242
August	6,919,525
September	9,502,665
October	7,539,385
November	10,191,782
December	7,373,210
Total	104,658,479
Divided as follows:	
To New York	57,367,845
To Boston	16,871,700
To Philadelphia	5,035,368
To Baltimore	3,369,506
To New Haven	3,738,465
To Brooklyn	4,908,648
To Bridgeport	1,680,970
To Portland	2,045,313
To St. Johns, Newfoundland	363,530
To Pawtucket	417,818
To Fall River, Mass	301,688
To Weehawken, N. J	470,703
To Stamford, Conn	368,536
To New Bedford, Mass	755,264
To Providence	313,520
To New York (box shooks)	4,908,648
To various points (rail)	1,751,457
	104,658,479
Total water shipments	102,907,022
Total rail shipments	1,751,457
	Tons.
Water shipments equivalent to	153,500
Rail shipments equivalent to	2,627

LETTER OF THE ATLANTIC COAST LUMBER COMPANY.

GEORGETOWN, S. C., *May 21, 1903.*

DEAR SIR: In the matter of showing the importance to Georgetown's coastwise commerce of the construction of an inland waterway between Norfolk, Va., and Beaufort Inlet, North Carolina, by means of which the perils of a long, all-ocean voyage and the passage of Hatteras would be avoided, and whereby barge transportation would be made practicable, I desire to submit the following facts, which are within my personal knowledge:

The well-known firm of Kirby, Carpenter & Co., operating large sawmills at Menominee, Mich., and extensive lumber yards at Chicago, were, at one time, compelled to pay from $4 to $4.50 per thousand feet on lumber between said points by vessel transportation; delays by weather conditions prevailing on the lakes were constantly encountered, and, by reason of uncertainty of transportation, want of dockage room and delay in discharging cargo constantly occurred, with consequent increase of expense and loss of profit. Said firm then adopted a system of barge transportation with these resultants: There were no delays because they thus had barges at the mills loading all the time, barges at Chicago discharging all the time, and barges on the lake going and coming all the time; instead of paying 45 to 50 cents per hour stevedore service (which was required because time of service was only two or three days out of each week), they paid ordinary mill wages (the service being continuous); instead of paying from $4 to $4.50 per thousand, as formerly, the freight rate was reduced to $2 per thousand.

When vessel transportation was in vogue between Chicago, Ill., Grand Haven, Muskegon, and Manistee, Mich., the freight rates on lumber were $2 per thousand. As soon as barge transportation was introduced said rates were reduced to $1.25 per thousand.

By the adoption of the use of whalebacks for barges and the towing of the same with whalebacks, the freight rates on iron ore and grain between Duluth, Minn., and the lower lakes, and between Duluth on the one side, and Buffalo and Cleveland on the other, were reduced very materially. The amount in dollars and cents I do not now recall.

Applying the test to our own home port, Georgetown, the rate of freight by vessel transportation is now and has been from $5.50 to $6 per thousand feet for lumber to Philadelphia and New York. The Atlantic Coast Lumber Company found it necessary to resort to a regular line of steamships carrying from 1,200,000 to 1,500,000 feet of lumber, built especially for lumber and other bulky freight transportation, and practically nothing more than large sea-going self-propelling barges. By this means the said freight rate on lumber was reduced from $5.50 to $2.75 to Philadelphia, and from $6 to $3.50 to New York. Before adopting the said steamship system, said company intended to resort to the system of barge transportation—that is, barges towed by seagoing tug boats, but found upon investigation that the necessary passage of Hatteras was an insurmountable difficulty. Had this system of transportation been possible, freights would have been reduced to $2 per thousand to New York and proportionately to Philadelphia, and all of the concurrent advantages to be derived from this system would have been enjoyed by the company.

Were the system of towing barges with a capacity of 600,000 feet in vogue, when reaching New York, they would be enabled to go direct to the dock where the lumber would be discharged, instead of having the expense of lighterage on small boats, as the Atlantic Coast Lumber Company is compelled at the present time to do with its steamers.

I have the honor to be, very respectfully, yours,

Freeman S. Farr.

Hon. Walter Hazard,
Chairman Committee Board of Trade, Georgetown, S. C.

LETTER OF THE PRESIDENT OF THE BANK OF DARLINGTON.

Darlington, S. C., *May 12, 1903.*

Dear Sir: Your favor of the 9th instant to Mr. E. M. Mathewes has been handed to me, with the request to write you along the line suggested in your letter. Mr. Mathewes will reply to that part relative to the Darlington Manufacturing Company.

I believe that the inland waterway would be of great advantage to the seaport towns and all the adjacent country along its route, and especially those places like Darlington, Cheraw, Bennettsville, etc., which could by means of a short railroad reach some navigable stream like the Great Pedee and other streams.

Darlington County raises 30,000 bales of cotton and 8,000,000 pounds of tobacco, besides other produce and manufactured products, and imports large quantities of products of various kinds. From January to May two long freight trains leave Florence every morning, of 25 to 40 box cars each, and are distributed from Darlington, on the roads leading from here to Hartsville, Wadesboro, Bennettsville, etc. As to what part of this freight could be induced to come and go by Georgetown is entirely speculative, but the Darlington freight could easily be transferred at either of the railroad bridges or brought here on a short train line from the river.

It is impossible to get accurate data of tonnage or shipments, because the railroad has this information, and it is not to their interest to give away such information.

I feel that it would be to the interest of this section to see the port of Georgetown fully developed, and the inland waterway constructed, and that an interest in the same will be taken by this section.

I, of course, would be glad to do anything to encourage and further the work, but I am sorry I can not suggest anything which I could do.

Yours truly,

Bright Williamson.

Mr. Walter Hazard, *Georgetown, S. C.*

LETTER OF THE DARLINGTON MANUFACTURING COMPANY.

Darlington, S. C., *May 12, 1903.*

Dear Sir: Replying to yours of the 9th, beg to say that we ship to New York or other points in the East about 200,000 pounds of goods monthly. Our present rate to New York on these goods is 48 cents per 100 pounds. We have taken up the matter of the freight rates through Georgetown with Mr. Kaminski, but have not as yet heard from him, so we can not tell you what the rate through your port will be.

In regard to the other information asked in your letter, we have referred same to Mr. Bright Williamson, of this city. We are very anxious to ship our goods through Georgetown, and if the Clyde Line will do as well for us through your port as through Charleston we think there will be little difficulty in routing our goods through Georgetown.

Yours, truly,

DARLINGTON MFG. CO.,
E. M. MATHEWES.

MR. WALTER HAZARD,
President Board of Trade, Georgetown, S. C.

LETTER OF THE SUPERINTENDENT OF THE WACCAMAW LINE OF STEAMERS.

CONWAY, S. C., *May 8, 1903.*

DEAR SIR: Replying to your favor of the 2d instant to Burroughs & Collins Company, relative to rates from Georgetown to points north of Cape Hatteras on certain articles of freight, I beg to say that we have not got the Georgetown rates, or would take pleasure in naming them, but if you will apply at the office of the Clyde Line in your city they will take pleasure in furnishing you with same.

Our through rate on naval stores and cotton is as follows: Rosin, per round barrel of 400 pounds, 54 cents; spirits turpentine, 80 cents per round barrel; cotton, $2.50 per round bale. The above is from Conway to New York. We have no rates to other points north.

We handle very little lumber, shingles, or cross-ties for northern shipments. The bulk of this class of freight is handled by sailing vessels, which is taken at the mills at Georgetown rates plus 30 cents per thousand feet for towing charges. Our rate on this class is $1.50 per thousand feet.

Answering your question as to the estimated reduction in rates on the above articles resulting from the use of barges by the proposed route—the inland water route—I would state that I think the reduction would at least be 50 per cent.

Yours, very truly,

D. T. MCNEILL.

MR. WALTER HAZARD, *Georgetown, S. C.*

LETTER OF MR. J. I. HAZARD.

GEORGETOWN, S. C., *May 12, 1903.*

GENTLEMEN: Your letter of the 7th instant duly at hand and noted. Replying I beg to state that the freight from this port to northern ports on the products which you mention is as follows:

Coal:	
From New York to Georgetown, per ton	$1.25
From Philadelphia to Georgetown, per ton	1.00
From Norfolk to Georgetown, per ton	1.00
Rice, Georgetown to New York, per barrel	.50
Cotton, Georgetown to New York, per bale	1.25
Shingles, Georgetown to New York and Philadelphia, per 1,000, 7-inch basis	2.25
Cross-ties, Georgetown to Boston, per 36-inch tie	.17
Cross-ties, Georgetown to New York, per 36-inch tie	.15
Spirits turpentine, per barrel	.65
Rosin, per 100 pounds	.09½

Could this project be continued to Georgetown by making us the terminus, and barge transportation established on a continuous inland route to Philadelphia, New York, etc., then perhaps a reduction may reasonably be expected, both in freight rates as well as insurance rates.

Further, I remain,

Very respectfully,

J. I. HAZARD.

MESSRS. W. D. MORGAN, F. S. FARR, W. HAZARD,
Committee of the Board of Trade, Georgetown, S. C.

LETTER OF MESSRS. FRASER & CO.

GEORGETOWN, S. C., *May 7, 1903.*

GENTLEMEN: In reply to your Mr. Hazard's communication of May 4, inquiring whether, in our opinion, the opening of a waterway between Beaufort, N. C., and Chesapeake Bay, thus avoiding the dangerous passage around Hatteras, would lower the rate of marine coastwise insurance, and whether there would be a decreased charge for barge insurance, we reply: First. We should estimate the decrease in marine insurance by the inland water route at from 15 to 20 per cent as against the rate for the outside passage. Second. We do not think any difference would be allowed for barge insurance as against steamers.

Yours, respectfully, FRASER & CO.

Messrs. W. D. MORGAN, F. S. FARR, W. HAZARD,
Committee Board of Trade, Georgetown, S. C.

LETTER OF THE GEORGETOWN, CHARLESTON AND WILMINGTON STEAMBOAT COMPANY, GEORGETOWN, S. C.

APRIL 5, 1903.

GENTLEMEN: I am in receipt of your letter, requesting an official statement giving an estimate of the probable decrease in insurance rates on marine risks by coastwise shipments between Georgetown and Northern ports which will probably result from the establishment of the inland waterway route between Beaufort, N. C., and Chesapeake Bay, thus avoiding the dangers and delays incident to navigation around Cape Hatteras.

Replying to above, I beg to say that I can not give you the official statement asked for, as I have nothing to do with fixing marine rates. This is done by boards of underwriters. This information, however, may be of interest to you: The present rate between Georgetown and Northern ports is, by sail, 1 per cent on grain and three-fourths of 1 per cent on general merchandise; whereas it is by steamboat one-fifth of 1 per cent on all goods. The rate inland could not be higher than by steamer around Cape Hatteras.

Yours, truly, B. A. MUNNERLYN.

Messrs. W. D. MORGAN, F. S. FARR, W. HAZARD,
Committee of Board of Trade, Georgetown, S. C.

EXHIBIT E.

LETTER OF THE BUREAU OF FREIGHT AND TRANSPORTATION, OF CHARLESTON, S. C.

DEAR SIR: At a meeting of the business men of Charleston, held at the rooms of the Chamber of Commerce on March 27, 1903, at which representatives of all the commercial organizations in the city were present, and after listening to the addresses of the Hon. J. H. Small, Congressman from the First district of North Carolina, and Mr. Clarence H. Forrest, secretary of the Merchants and Manufacturers' Association of Baltimore, in regard to the proposed inland waterway from Chesapeake Bay via Elizabeth River, Dismal Swamp Canal, or Albemarle and Chesapeake Canal, Albemarle Sound, Croatan Sound, Pamlico Sound, and Core Sound to Beaufort Inlet, or such route between Norfolk, Va., and Beaufort Inlet, North Carolina, or route the engineers may adopt, the following resolution was offered by Mr. R. G. Rhett and unanimously adopted:

"*Resolved*, That the business men of Charleston approve heartily of the project of improving the inland water communication as outlined by Messrs. Small and Forrest.

"*Resolved further*, That the freight bureau of Charleston be requested to collect the information asked for by these gentlemen and transmit same to the Hon. J. H. Small."

In securing the information desired the larger number of the business public has been seen and all feel that the building of this waterway is highly desirable and would result in great benefit to this city and section, not only in the development of its resources, but in the lowering of the freight rates on such commodities as can be handled by a barge.

It was desired that we submit a complete statement of all the coastwise trade from this port for, say, 1902, but it was found that no statistical data of this kind had been kept, and it is therefore impossible to make this information complete.

For the calendar year of 1902 imports through the port of Charleston were $1,775,265; exports, $5,320,029.

The table below will show the coastwise movement of the heavier commodities, which can be handled by barge.

	Tons.
Grain	1,556
Hay	1,161
Flour	3,224
Grits and meal	522
Meat and lard	1,275
Rice	2,893
Sugar	11,115
Bagging	705
Iron pipe	1,567
Total	23,518

The above is made up from statistics kept of the coastwise movement by steam vessels. The average rate on the above would be $1.75 per ton. Moving these commodities by barge could probably be done at a saving of 50 cents per ton, which would amount to $12,000.

The following table shows the domestic trade of Charleston for the year 1902, not including cotton, coal, rice, lumber, cross-ties, naval stores, phosphate rock, and cotton-seed oil:

	Value.
Groceries	$17,875,000
Grain and hay	325,000
Dry goods	6,270,000
Boots and shoes	1,776,500
Hats and caps	264,000
Tobacco	945,000
Drugs and medicines	975,000
Hardware	1,523,500
Crockery	250,000
Paints and oils	528,000
Saddlery	115,000
Stationery	475,000
Furniture	715,000
Doors, sash, and blinds	330,000
Clothing	975,000
Fruit	250,000
Ice	50,000
Fish and oysters	225,000
Jewelry	285,000
Canned goods	50,000
Manufacturing industries, including fertilizers, estimated	10,700,000
Total	44,902,000

The following table gives the articles not enumerated above, and which could with safety be handled by barges at great saving of freight:

Articles.		Quantity.	Value.
Coal	tons	100,000	$475,000
Cotton, upland	bales	300,000	13,000,000
Cotton, sea-island	bags	8,000	750,000
Rice	barrels	64,653	982,725
Lumber and cross-ties	feet	84,101,992	1,009,212
Turpentine	casks	1,900	47,500
Rosin	barrels	21,000	63,000
Phosphate rock	tons	46,000	1,610,000
Cotton-seed oil	barrels	60,000	120,000
Total			18,057,437

The present average rates of transportation are:

Coal (sail), per ton	$1.20
Cotton (steamer), per bale	.75
Cotton, sea island (steamer), per bag	.90
Rice (steamer), per barrel	.45
Lumber (steamer), per M feet	5.50
Turpentine (steamer), per cask	.80
Rosin (steamer), per barrel	.45
Phosphate rock (steamer), per ton	1.60

It is estimated that the saving in freight by barge transportation on coal, cotton, lumber, rice, and phosphate rock and cotton-seed oil would amount to $377,000 per annum, and the reduction in the cost of transportation would in a short time increase the volume of the business.

The uncertainty of the time of arrival of shipments of lumber from southern ports by sail vessels has had the effect of holding back the development of this trade with the eastern seaboards, and it is the opinion of our lumber shippers that with the more prompt delivery by barge they should be able to overcome this difficulty, and thereby increase this business.

Our coal trade feel that with the cheaper rates and more prompt movement by barge, they would be able to handle by this means coal that they are now forced to handle all rail, and that this would enable them to compete for the coaling of foreign steamers, that do not now coal at South Atlantic ports.

With increased transportation facilities, such as could be obtained by barge, the movement of cotton-seed oil could be greatly increased, and our various other commodities, such as kaolin clay, which would also seek this means of transportation.

The movement of cotton, rice, etc., by barge would be an experiment with our shippers, but they are of the opinion that with closed barges this could be accomplished with perfect safety.

There are many commodities now moving from interior points within our State all rail that would, with the development of this project, seek this means of transportation, and we feel that we can with safety give assurance that it will have the support of our community and State.

Respectfully submitted.

H. R. Jackson,
Manager Bureau of Freight and Transportation of Charleston, S. C.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of Board of Engineers, having under consideration the project of an inland waterway between Norfolk, Va., and Beaufort Inlet, North Carolina.

Exhibit F.

LETTER OF THE SAVANNAH (GA.) CHAMBER OF COMMERCE.

August 1, 1903.

Dear Sir: At a meeting of the business men of the city of Savannah, held at the Board of Trade March 30, 1903, at which representatives of the mayor and aldermen, the Board of Trade, Cotton Exchange, and Chamber of Commerce were present, and after listening carefully to the remarks of the Hon. John H. Small, Congressman from the First district of North Carolina; Mr. C. H. Forrest, secretary of the Merchants and Manufacturers' Association of Baltimore, and Mr. W. H. Lumsden, secretary of the chamber of commerce of Norfolk, Va., regarding the proposed inland waterway from Chesapeake Bay via Elizabeth River, Dismal Swamp Canal, or Albemarle and Chesapeake Canal, Pasquotank River, Albemarle Sound, Croatan Sound, Pamlico Sound, and Core Sound to Beaufort Inlet, the following resolutions were offered by Col. J. H. Estill, president of the Chamber of Commerce, duly seconded, and unanimously adopted, viz:

"*Resolved*, That the meeting heartily indorse the project of the inland waterway as outlined by Messrs. Small, Forrest, and Lumsden.

"*Resolved*, Further, that the secretary of the Chamber of Commerce be requested to compile the necessary data asked for by these gentlemen and that same be properly transmitted."

The compilation of the statistics which appear below has had very careful attention and consideration and represents actual figures. The statistics have been obtained from the most accurate records that are kept.

Statement showing the receipts at Savannah by coastwise sailing vessels, year ending December 31, 1902.

Commodity.	Tons.	Amount of freight paid.	Amount saved by barges.
Brick	2,754	$4,131.00	$2,065.50
Cement	5,171	5,171.00	2,585.50
Sulphur	100	100.00	50.00
Tankage	8,615	12,922.50	6,461.25
Coal	73,217	65,895.30	32,947.65
Railroad iron	10,534	15,802.00	2,065.50
Salt	8,222	7,399.80	3,699.90
Phosphate	8,500	12,750.00	6,375.00
Fish scrap	3,501	4,376.26	2,188.13
Total	120,614	128,547.86	64,273.93

Statement showing the receipts at Savannah, by coastwise steamships, year ending December 31, 1902.

Commodity.	Tons.	Amount of freight paid.	Amount saved by barges.
Boots and shoes	3,974	$33,376.00	....
Canned goods	9,311	26,506.80	$13,253.40
Oil	6,592	25,169.30	....
Whisky	629	3,145.00	....
Grain and grain products	47,074	94,248.00	47,124.00
Tobacco and cigars	1,185	13,035.00	....
Special iron and iron manufactured	42,386	128,158.00	64,079.00
Fertilizers	8,563	66,455.00	33,227.50
Tin plate	1,239	6,938.40	3,469.20
Wool	8	72.00	....
Sugar	22,699	99,416.80	49,708.40
Hay	4,075	8,150.00	4,075.00
Packing-house products	9,097	18,294.00	....
Steel rails	7,993	23,979.00	11,989.50
Hardware	1,486	13,374.00	6,687.00
Bagging	7,283	10,196.00	5,098.00
Paper	3,649	13,136.40	6,568.20
Coffee	4,816	15,892.80	7,946.40
Dry goods	13,841	152,251.00	....
Fruit	2,738	6,086.80	....
Vegetables	6,252	12,907.20	....
Cordage	317	1,585.00	792.50
Wagons, carriages, tools, and implements	597	6,567.00	3,283.50
Paints and oils	2,806	15,699.80	7,848.40
Cotton-factory products	4,600	25,760.00	12,880.00
Groceries	13,592	32,520.80	16,260.40
Miscellaneous	104,877	....	....
Total	333,669	852,920.10	294,290.40

Statement showing the shipments from Savannah by coastwise steamships, year ending December 31, 1902.

Commodity.	Tons.	Amount of freight paid.	Amount saved by barges.
Oranges	5,372	$48,348.00	....
Pineapples	1,360	12,240.00	....
Melons	5,437	23,782.00	....
Other green fruit	1,099	2,198.00	....
Clay	4,041	8,082.00	$4,041.00
Staves	16	41.60	20.80
Shingles	152	395.20	197.60
Cotton-seed oil	23,587	58,945.00	29,472.50
Boots and shoes	7	77.00	....
Dry goods	7,170	78,870.00	....
Wool	490	4,410.00	....
Oil	2,084	5,210.00	....
Grain and grain products	255	510.00	255.00
Cotton	55,338	294,979.80	147,489.90
Vegetables	6,662	17,642.20	....
Lumber	166,981	530,483.50	265,241.75

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Statement showing the shipments from Savannah by coastwise steamships, year ending December 31, 1902—Continued.

Commodity.	Tons.	Amount of freight paid.	Amount saved by barges.
Cotton-seed products	12,593	$31,482.50	$15,741.25
Iron, pig and bloom	48,721	116,930.40	58,465.20
Cotton-factory products	18,842	105,515.20	52,757.60
Canned goods	1,314	3,681.60	1,840.80
Tobacco and cigars	979	10,769.00	....
Fruit	4,273	15,382.80	....
Cordage	43	536.00	268.00
Special iron	345	1,035.00	517.50
Fertilizer	4,223	8,446.00	4,223.00
Turpentine, rosin, and rosin oil	132,019	249,702.60	124,851.30
Miscellaneous	30,013	....	....
Total	533,416	1,629,695.40	705,383.20

Statement showing tonnage in and out of Savannah Harbor for year ending December 31, 1902.

	Tons.
Foreign	606,681
Coastwise steamships	867,085
Coastwise sailing vessels	457,034
Inland commerce	180,000
Savannah River Boats	55,530
Total	2,164,330

Statement showing the value of the tonnage in and out of Savannah Harbor for year ending December 31, 1902.

Foreign	$47,671,951
Coastwise steamships	104,050,200
Coastwise sailing vessels	9,140,680
Inland commerce	1,800,000
Savannah River boats	3,353,585
Total	166,016,416

Recapitulation, showing freights received at and shipped from Savannah, year ending December 31, 1902, in tons, amount of freight paid on same, and the amount that could be saved if shipments were made by barge.

	Tons.	Amount of freight paid.	Amount of freight saved by barge.
Receipts by sailing vessels	120,614	$128,547.86	$64,273.86
Receipts by steamships	333,669	852,920.10	294,290.40
Shipments by steamships	533,416	1,629,695.40	705,382.20
Total	987,699	2,611,163.36	1,063,946.46

Taking into consideration that it is estimated that the inland waterway will cost, complete, from $7,000,000 to $10,000,000—say, the latter figure—and estimating the annual cost of maintenance to be $50,000 and the annual interest on the cost of the waterway to be $500,000, we have an aggregate amount, including the annual interest and annual cost of maintenance, of $550,000.

By referring to the recapitulation shown above it is clearly demonstrated that, taking into consideration the commerce of Savannah for the year ending December 31, 1902, there would have been saved to this port alone the sum of $1,063,946.46, or $513,946.46 more than the entire expense of the inland waterway—that is, the cost of maintenance and the interest on the amount expended.

Savannah's commerce is largely coastwise and is increasing rapidly every year. Out of the entire commerce for 1902 of 2,164,330 tons the coastwise commerce consisted of 1,324,019 tons, valued at $113,190,880. This shows the amount of tonnage and the valuation of such tonnage that will be affected by the establishment of the inland waterway.

In the preparation of this report nearly all of the most prominent business men have been seen, and they are confident that the building of this inland waterway is indeed very desirable and would result in an immeasurable benefit to Savannah, not only in the development of our resources, but in the reduction of freight rates on the greater number of the commodities that are received and shipped from this port; also a great saving in insurance.

Savannah, being the largest and most important seaport on the South Atlantic, with transportation facilities unequaled, it is evident that by the introduction of barge transportation numerous commodities that are now moving from the interior by rail would be shipped to Savannah to seek this cheaper water route and thereby secure a large saving in freight charges.

There are in the State of Georgia quite a number of resources that are at this time undeveloped on account of excessive freight rates. With the introduction of barge transportation it is probable that these resources will undoubtedly be developed, which will mean an immense increase in the business of Savannah.

In the preparation of this report there has not been taken into consideration the large amount of freights that have been received in Savannah by rail, being shipped that way on account of the uncertainty of the time of arrival of sailing vessels, etc., and which with the development of the inland waterway would seek that cheaper and at the same time secure route.

To enter into a discussion of the large amount of traffic that would be affected by the introduction of barge transportation, other than that shown in statements above, can hardly be gone into accurately. It is needless to say that with freight rates lower by 50 per cent than those in effect at present, the volume of business would greatly increase. The fact is the lower the freight rates the larger the amount of traffic handled.

The introduction of the inland waterway will have two well-recognized effects upon railway revenue. The first effect will be to reduce the tariff. This would mean that we will have lower rail rates. It is generally considered that a reduction of the rail rate would entail a loss of revenue, but it must be taken into consideration that the amount of income from traffic is the product of two variables, viz, the tonnage and the tariff. An increase in the rate will, as a general thing, reduce the amount of freight carried. To reduce the rate will increase the business.

By the introduction of barge transportation we may look for a rapid development in all of the unlimited resources of the Southeast, and the establishment of numerous and varied industries.

Respectfully submitted.

W. J. Donlan,
Secretary the Savannah Chamber of Commerce.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

Exhibit G.

LETTER OF THE BRUNSWICK (GA.) BOARD OF TRADE.

Gentlemen: On Thursday, the 2d of April, 1903, Hon. John H. Small, member of Congress from North Carolina, appeared before the Board of Trade of Brunswick, in company with Mr. C. H. Forrest, of Baltimore, and presented the project for an inland waterway or canal from Chesapeake Bay to Beaufort Inlet, avoiding the danger to navigation at Hatteras and Diamond Point shoals.

The Board had previously addressed resolutions to the Georgia Senators and Representatives in Congress, urging their support of the project.

At the suggestion of Mr. Small, that it was desired that commercial bodies of ports on the South Atlantic coast present to your Board statistical and other information bearing upon the commercial value of such improvement, the undersigned were appointed a committee to compile such a report.

We have the honor to refer to the statistics of commerce at Brunswick, embodied in the report of Capt. Cassius E. Gillette, U. S. Army, for the years 1878 to 1898, found in Chief of Engineers' Reports for 1900, paragraph 3, page 1496, supplemented with statistics from same sources of information for the years 1899, 1901, and 1902:

Arrivals and clearances of vessels and commerce at Brunswick, Ga., etc.

CLEARED.

Year.	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
1878	124	32,767	874	28	9,231	236	49	21,218	550	201	63,216	1,660
1879	157	42,345	1,116	21	7,172	172	47	21,730	555	225	71,247	1,843
1880	270	78,913	2,010	14	5,010	115	48	19,970	550	332	103,900	2,675
1881	252	82,155	1,732	17	7,218	156	87	42,659	1,014	356	132,932	1,902
1882	278	96,170	2,086	19	7,761	170	101	48,699	1,139	398	152,630	3,395
1883	257	91,036	1,962	28	11,268	240	124	55,717	1,369	411	158,021	3,571
1884	176	62,927	1,322	38	16,209	335	148	70,612	1,633	362	149,478	3,290
1885	196	71,345	1,481	21	8,696	190	135	62,437	1,456	352	142,478	3,127
1886	184	67,020	1,413	17	7,528	159	117	56,280	1,305	318	130,828	2,877
1887	130	51,305	958	5	5,858	143	121	72,894	1,526	276	130,057	2,627
1888	785	266,152	8,240	13	4,715	116	173	102,300	2,236	971	373,227	10,592
1889	169	65,809	1,273	11	4,266	103	221	130,919	2,830	401	200,994	4,206
1890	247	122,820	2,024	18	8,745	165	172	107,197	2,261	437	238,762	4,450
1891	313	186,171	3,432	26	16,045	234	141	94,827	1,980	480	297,043	5,646
1892	390	247,329	4,228	19	6,882	174	163	109,728	2,334	572	363,939	6,736
1893	420	236,856	4,165	13	6,857	121	159	119,282	2,266	590	362,995	6,552
1894	363	235,307	4,481	14	6,081	125	223	193,483	3,260	600	434,871	7,886
1895	458	290,702	5,260	9	4,155	103	182	148,892	2,811	649	443,749	8,174
1896	591	323,357	5,759	18	8,638	173	150	112,446	2,248	759	444,441	8,180
1897	764	432,089	6,940	15	6,155	117	274	246,302	4,326	1,053	684,546	11,383
1898	769	406,016	6,255	12	6,028	99	255	265,381	4,371	1,036	677,425	10,725

Clearances not given for 1899, 1901, and 1902.

Commerce of Brunswick.

Year.	Value of exports.	Value of imports.	Total collection.	Year.	Value of exports.	Value of imports.	Total collection.
1878	$1,372,842	$400	$4,500.97	1889	$7,894,281	$6,557	$8,933.66
1879	1,394,401	3,197	5,644.33	1890	7,355,841	7,326	5,748.00
1880	1,702,570	8,098	17,723.27	1891[a]	9,742,553	3,014,207	5,982.07
1881	2,230,000	4,377	29,305.30	1892	5,372,775	22,988	6,408.15
1882	1,700,000	2,734	20,058.90	1893[a]	7,297,973	1,680,512	5,768.00
1883	3,437,000	3,093	24,911.61	1894[a]	9,940,453	3,549,378	9,141.41
1884	3,500,000	958	19,780.32	1895[a]	7,520,404	3,328,407	7,422.10
1885	3,063,960	4,008	3,939.27	1896	5,727,074	15,072	8,047.11
1886	2,828,656	2,397	5,834.43	1897[a]	12,582,114	5,803,110	18,586.57
1887[a]	4,121,660	2,815,769	37,520.00	1898[a]	15,259,533	6,995,941	23,080.00
1888[a]	7,552,025	3,140,231	7,438.04				

[a] Coastwise and foreign.

Exports and imports, 1898.

	Tons.	Value.
Exports, domestic (coastwise) and foreign	573,370	$15,259,533
Imports	35,630	6,995,941
Total	609,000	22,255,474

Commerce of Brunswick.

Year.	Value of exports.	Value of imports, coastwise and foreign.	Domestic shipments.
1901	$8,126,832	$11,058,030	$7,227,361
1902	7,319,233	11,914,118	6,392,287

Total exports and imports, 1901, domestic, coastwise, and foreign, $26,412,223.
Total exports and imports, 1902, domestic, coastwise, and foreign, $25,625,638.

Commercial statistics for 1898, port of Brunswick.

Articles.	Exports.	
	Foreign.	Domestic, coastwise.
Cotton .... bales..	311,916	14,848
Cotton seed .... tons..	4,537	....
Yarn .... bales..	....	1,442
Phosphate .... tons..	66,351	....
Rosin .... barrels..	209,648	35,012
Turpentine .... do....	48,969	21,903
Lumber and timber .... feet B. M..	18,876,000	111,228,000
Cross-ties .... number..	44,129	1,051,518
Shingles .... do....	1,808,000	3,431,810
Laths .... do....	30,500	75,000
Pig iron .... tons..	21,194	....
Oysters .... cases..	....	....
Merchandise .... tons..	413	2,096
Staves .... number..	9,453	....
Meal and cakes .... tons..	2,964	....
Cotton-seed oil .... barrels..	....	7,718

Commercial statistics 1902, port of Brunswick.

Articles.	Exports.	
	Foreign.	Domestic, coastwise.
Cotton .... bales..	110,086	23,702
Cotton seed .... tons..	2,497	....
Yarn .... bales..	....	....
Phosphate .... tons..	31,680	....
Rosin .... barrels..	174,646	113,086
Turpentine .... do....	52,537	18,649
Lumber and timber .... M feet..	28,511	152,152
Cross-ties .... superficial feet..	7,716,466	78,562,917
Shingles .... pieces..	713,272	10,129,779
Laths .... do....	5,100	291,800
Pig iron .... tons..	937	....
Oysters .... cases..	....	....
Merchandise .... bales and boxes..	2,678	9,563
Staves	....	....
Meal and oil cake .... tons..	3,785	2,334
Cotton-seed oil	....	....

The foregoing statistics of arrivals and clearances of vessels strikingly illustrate, both in number of vessels and tonnage of vessels engaged in the coastwise trade as compared with the number of vessels engaged in the foreign trade, the large preponderance of such coastwise trade which is immediately affected by such an improvement as the contemplated canal or inland waterway.

The proportion of foreign to domestic imports is not shown, but the comparison of domestic with foreign exports (except in the items of cotton, cotton seed, pig iron, staves, and meal and oil cakes) strikingly illustrate this preponderance of our coastwise over our foreign commerce.

The dangers of navigation off Hatteras and Diamond Point shoals are so well understood that this committee does not deem it necessary to do more than state that numbers of vessels loaded at Brunswick for northern ports have been wrecked there—in many instances accompanied with loss of life.

Another difficulty of navigation for coastwise vessels off Hatteras within the knowledge of members of your committee, which was not discussed by Mr. Small in his admirable address before our Board of Trade, seems worthy of mention as a strong argument in favor of such inland waterway, namely, the frequent delay of sail vessels for days, and sometimes even for weeks, awaiting favoring winds to enable them to pass Hatteras. So serious is such delay that a plan has been seriously considered for creation of a towboat company, to operate seagoing tugs for the purpose of relieving vessels from this delay, a source of loss not only to the shipping, but to consiguors and consignees as well.

The reduction of rates upon the bulky products of which our coastwise freights are largely composed would be of great importance to this port, as well as the lower insurance rates upon all products shipped by such inland waterway.

Brunswick is inaugurating manufacturing enterprises. Deep interest is taken by the Board of Trade and our people in this subject. A number of small manufactories have been recently established. This movement is gaining strength, and will inevitably result in the establishment of important manufacturing enterprises. The people have raised $300,000 and had it underwritten, as an inducement to a steel plant and shipyard to locate here, costing for plant $6,000,000, employing 6,000 hands, and turning out 1,600 tons of finished steel and iron products per day. We hope it will come, but whether it does or not, the spirit which raised this $300,000 will bring, and quickly, important enterprises of like character.

To all such enterprises the problem of low freights on coal and of a low-water rate to compete with and to reduce rail rates is obvious, and of great importance in the handling of raw and finished product.

Indirectly the effect of a reduction of rates on coastwise freights would increase our foreign commerce—especially such portion of it (not inconsiderable in amount) as finds an outlet via New York, Boston, and other Northern ports.

While it may seem superfluous to say anything in a report addressed to a Board of military engineers as to the importance from a coast-defense view of such an inland waterway, it may not be inappropriate to give expression to the view universally held by our intelligent citizens that such an inland waterway is of vital importance in the event of war.

Our intelligent citizens are, we think, unanimous also in the expression of the hope that this inland waterway may be first opened, because it is at the greatest danger point, but that it may become a part of an inland system of waterways beginning at the Great Lakes, thence via Raritan Bay, New Jersey, reaching the mouth of the St. Marys River, thence by the barge canal recommended by the lamented General Gillmore of your corps, to its headwaters in the Okefenokee swamp, thence by the Suwanee River to the Gulf, thence to New Orleans via natural and artificial waterways.

With our commerce growing so rapidly that the vast network of railroads, constantly increasing mileage, motive power, and cars are utterly unable to cope with it, with freight blockades at all the great centers of industry due to want of facilities, with numerous important manufactories compelled to shut down frequently for want of coal due to want of cars and motive power, the entire subject of improvement of our inland waterways becomes of deepest concern to all patriotic citizens, and we welcome every well-considered project for such improvements, whether in our immediate vicinity or not, and more especially for the project under consideration, as of deepest interest and most intimate relation to our progress and growth.

Very respectfully,

C. P. Goodyear.
E. F. Coney.
W. B. Cook.
C. D. Ogg.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

Exhibit H.

LETTER OF THE FERNANDINA (FLA.) BOARD OF TRADE.

June 27, 1903.

Dear Sir: The port of Fernandina, officially designated as the entrance to Cumberland Sound, lying latitude 30° 40″ and longitude 81° 26″, is the most southerly deep-water port on the Atlantic coast of the United States. Its location is at the mouth of a deep fresh-water river, the St. Marys, and from the first settlement of Florida it has always been known for the superior depth of water and excellence of its harbor. In 1881, recognizing its peculiar advantages and its prospective value as a deep-water port, the Government of the United States began the improvement of the entrance by a system of jetties intended to attain an ample depth at mean low water on the bar. Appropriations having been made from time to time aggregating over $2,500,000, the entrance and channel from the sea has been increased from a low-water depth of about 12 feet to a permanent depth of over 24 feet at low water and 29 to 30 feet at high water, thus placing this port in the ranks of the very best harbors on the Atlantic coast and superior to most of them, with a prospect of a still further increase in depth of water, which would make it, all things considered, the most available port on the entire southern coast

The natural result of this improvement of the port of Fernandina has been to gradually draw to and through it not only the coastwise transportation of the products of Florida, but to a still greater degree a very large foreign export business of phosphate rock and naval stores to European countries and of lumber to South America and the islands of the Caribbean Sea. The largest class of commercial steamships, drawing upward of 24 feet of water, and taking on cargoes of 3,000 tons and upward, have entered and gone to sea without hindrance.

The coastwise traffic in lumber has given employment to large numbers of sailing vessels, carrying each from 500,000 to 1,000,000 feet.

The following statistics show the business of this port:

Arrivals and clearances of vessels, and commerce, at Fernandina, Fla.

COASTWISE.

Year.	Number.	Tonnage.	Crew.
1899	201	181,857	1,690
1900	206	169,985	1,608
1901	213	198,885	1,895
1902	255	199,009	1,988
Total	875	749,736	7,181

VALUE OF EXPORTS, COASTWISE.

1899	$5,990,632.00
1900	7,495,639.00
1901	7,358,789.00
1902	10,979,123.00
Total	31,824,183.00

VALUE OF IMPORTS, COASTWISE.

1899	$135,821.00
1900	9,900.00
1901	169,600.00
1902	17,681.50
Total	333,002.50

The above tables, which are made up from records in the custom-house, show a steady increase in the shipment of coastwise commodities, indicating that the commerce of the port has almost doubled in the past four years. The records of the custom-house show that the year 1903, judging from the five months just ending, will be greater in volume of business through the port than in any previous year.

The project of an ample inland waterway between the Chesapeake at Norfolk and Beaufort, N. C., which has been presented to us for our consideration, is entitled to a careful estimate, both as to its immediate local benefits and its ultimate advantages to the whole southern coast. In the first place it would enable sailing vessels in bad weather to avoid a dangerous shoal on which countless vessels have been wrecked, thus lessening the perils of the sea and insurance rates on vessels and cargoes.

Under existing conditions the railways of the country are often congested and unable for considerable periods of time to move the freights awaiting transportation, to the great detriment of business in all its branches. There exists, therefore, a great necessity for utilizing as far as possible transportation by water, as has been illustrated in the traffic of the great West to eastern ports. For a long time sailing vessels and steamboats delivered freights to the Erie Canal and railways at Buffalo, but so great was the demand for increased facilities of transportation that the establishment of barge lines, employing barges of great capacity, towed by powerful steam tugs, became a necessity.

This system seems now to be the necessity of the future, being far more economical and available to a greater degree for moving the more bulky products from the interior to the seaboard. The Erie Canal is to be enlarged at a cost of $100,000,000.

Nature has already opened an inland waterway along the Atlantic coast with but few interruptions which can easily be remedied, and it is within the probabilities that an inland waterway will be opened from New York to Biscayne Bay, and from Fernandina to St. Andrews Sound, available for commercial purposes and for the class of defensive naval vessels such as torpedo boats, etc.

The port of Fernandina is on the main line of this inland waterway. Should the project of connecting Chesapeake Bay with Beaufort Inlet be carried into effect, and some further improvement be made in the existing inland passage to Savannah and thence northward, this port would have the advantage of such communication by barges, in addition to its present fleet of sailing vessels and steamships. At times our piers are overburdened with lumber awaiting shipment, and if barges could relieve the strain it would be a very great advantage. As facilities increase, expenses are lessened and the producer is benefited.

The Board of Trade of Fernandina therefore is heartily in favor of the project of connecting the waters of Chesapeake Bay with Beaufort by a canal having a depth sufficient for its being utilized by coasting vessels or barges engaged in the coasting trade of the South Atlantic coast, and we favor the construction of such canal by the General Government, to which in time of war it would be of supreme importance.

Very respectfully,

Geo. R. Fairbanks,
Saml. A. Swann,
Geo. L. Baltzell,
Committee.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort, North Carolina.

Exhibit I.

LETTER OF THE JACKSONVILLE (FLA.) BOARD OF TRADE.

July 18, 1903.

Dear Sir: By the direction of the Board of Trade of the city of Jacksonville, Fla., I am directed to present to the Board of Engineers having under consideration the construction of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina, certain commercial statistics of the port of Jacksonville and St. Johns River, and to submit some facts and arguments showing the importance to this city of the construction of the said waterway.

Coastwise commerce of the city of Jacksonville and St. Johns River, Florida, during the calendar year ending December 31, 1902.

	Tons.		Tons.
Yellow-pine lumber	248, 518	Bacon	60, 745
Cypress	10, 214	Potatoes	1, 837
Shingles	142, 260	Canned goods	3, 500
Cross-ties	872, 500	Flour	44, 000
Cedar logs	145	Salt	2, 027
Laths	81	Beans	825
Cotton, sea-island	5, 626	Coffee	270
Tobacco	88	Hay	18, 750
Oranges	3, 263	Steel rails	23, 540
Vegetables	4, 600	Corn and oats	12, 375
Doors	52	Naval stores	60, 000
Kaolin	5, 056	Brick	37, 500
Miscellaneous packages	85, 718	Gasoline	3, 450
Coal	33, 907	Fertilizers	6, 480
Oil	15, 689	Wines and liquors	3, 657
Boots and shoes	1, 551		
Sugar	2, 530	Total	1, 710, 754

Arrivals and departures of vessels for the year ending December 31, 1902.

Kind of vessel.	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steamers	215	555,304	215	558,340
Sailing vessels	305		324	
Total	520	....	539	....

Estimated number of passengers carried by water	475,000
Estimated percentage of total trade of neighorhood carried by water ....per cent..	25

The coastwise commerce between Jacksonville and the Atlantic ports north of Cape Hatteras is carried by large steamships and sail vessels. The movement by small steamers and vessels and barges is practically prohibited on account of the dangerous navigation around Cape Hatteras. Attempts have heretofore been made to establish barge transportation between the South Atlantic ports and the ports north of Cape Hatteras, but in each instance it had to be abandoned on account of the menace to navigation on the coast of North Carolina, resulting in destruction of barges and loss of cargoes.

It is conceded that transportation by water affords the cheapest movement, particularly of bulky products. and that transportation by barges is the cheapest of any form of transportation by water.

I have selected from the foregoing table certain articles which could be moved with greater dispatch and economy of movement by barges than in any other manner, and I herewith append a statement giving the names and tonnage of the articles of commerce:

	Tons.		Tons.
Yellow-pine lumber	248,518	Oil	15,689
Cypress	10,214	Salt	4,027
Shingles	142,260	Hay	18,750
Cross-ties	872,500	Steel rails	23,540
Cedar logs	145	Naval stores	60,000
Laths	81	Brick	37,500
Cotton, sea-island	5,626	Fertilizers	6,480
Kaolin	5,056		
Coal	33,907	Total	1,482,293

It will be seen that the aggregate tonnage of the above articles was 1,482,293 tons, which represents the commerce of Jacksonville in these several articles during the year 1902. The great bulk, if not all of these several articles, were moved between Jacksonville and ports north of Cape Hatteras. Having made a careful examination of the existing tariff rates, and having considered, from the best obtainable sources, the reduction in freight rates which would be effected if these articles could be moved by barge transportation, I am of the opinion that the reduction would amount to at least 50 cents per ton. However, with a view to making every reasonable allowance, I feel sure that the minimum reduction which would follow would be 25 cents per ton. Based upon the tonnage above given, I therefore estimate that the commerce of Jacksonville and St. Johns River would experience an annual saving of $370,573.

It will be noted that the above estimate is based upon the commerce of Jacksonville for the year 1902, but it must be remembered that even under the present conditions the commerce of this port is constantly growing. With the impetus resulting from the construction of this inland waterway our coastwise trade would expand even more rapidly. The territory accessible by rail and by water, for which Jacksonville is the entrepôt, comprises the eastern and northern half of Florida and also a large section of southern Georgia. The reduced freight rates resulting from the construction of this waterway would result in a more rapid influx of population, the greater promotion of manufacturing enterprises, bringing increased consumption of raw and manufactured products, and thereby greatly augmenting our commerce.

The total valuation of the coastwise commerce to this port for 1902 amounted to $20,759,929. If that moved by rail were included the value would approximate $80,000,000. It can thus be demonstrated how greatly the commercial interest of Jacksonville would be promoted by the construction of this inland waterway.

There are other inland waterways which demand attention from the General Government and which must ultimately be improved. There is at present a natural inner passage from Jacksonville to Savannah and thence to Winyah Bay on the coast of South Carolina, which could be deepened to 16 feet with comparatively small expense. It is entirely practicable to extend this waterway northward to the Cape Fear River at Wilmington, N. C., and thence farther north to Beaufort Inlet, the southern outlet of the waterway under immediate consideration. There is also the proposed canal across the State of Florida which has been demonstrated by the United States engineers to be an entirely practicable proposition. This would give the commerce of the Gulf ports the same advantages of barge transportation and reduced freight rates for bulky products as would be enjoyed by Jacksonville and other points on the Atlantic seaboard.

With the construction of the waterway under consideration, which will avoid the dangers of Cape Hatteras and afford to all the seaboard cities from Florida north the immense advantages of transportation by barges, a public sentiment will be aroused which will result in a demand, which can not be ignored, from the Gulf ports and other sections, for an extension of these commercial advantages.

Very respectfully,

CHAS. H. SMITH,
Secretary Board of Trade.

Col. CHARLES J. ALLEN, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

EXHIBIT J.

LETTER OF THE ELIZABETH CITY (N. C.) CHAMBER OF COMMERCE.

MAY 15, 1903.

DEAR SIR: Inclosed please find report of the amount of freight handled at Elizabeth City, N. C., for the year 1902. If our estimates on reduced freight rates are correct, and we think they are, there will be a saving of $213,876 per annum on our present business, and this, you will see by the report, does not include over one-half of the articles handled at this port. It is estimated that the amount of tonnage given can be multiplied by three to represent the business of the Albemarle Sound and its tributaries, namely: Perquimans, Yeopim, Chowan, Cashie, Roanoke, Scuppernong, and Alligator rivers, and the country contiguous thereto. With deep-water transportation, it is estimated that the volume of business would be double in five years. With large barge transportation the following industries could reasonably be expected to spring up in our midst, namely: (1) The manufacture of pulp from our abundance of timber and wood, especially adapted for that purpose; (2) the manufacture of brick for northern markets from our clay subsoil, which is inexhaustible; (3) the shipping of cord wood of various kinds, so abundant among us, to the northern market, and the return of the barges laden with coal and goods for the southern cities. Various other industrial enterprises could be mentioned, if we deemed it necessary. Transportation in this section could be carried on almost during the entire year, owing to our mild winters. We desire, my dear sir, to call your attention especially to the geographical location of Elizabeth City, and to give you some reasons why the proposed inland waterway should come by the Dismal Swamp Canal.

Elizabeth City is situated at the head waters of the Pasquotank River, 18 miles from the sound, having a water front of 1 mile in extent, an average depth of from 12 to 18 feet, and a commodious harbor for the anchorage of sailing vessels where they take the regular tows north-bound through the Dismal Swamp Canal. The Pasquotank River at Elizabeth City is a mile wide, broadening a short distance below the city, and being 4 miles wide at its mouth. Elizabeth City has over 9,000 inhabitants, as shown by a recent survey of the city by the electric light and water company, which gives 2,300 houses within the corporate limits. With an average of 4 persons to a dwelling, this would give us a population of 9,200. The census of 1900 shows only 6,300, hence you will note that our population has increased 50 per cent in three years. It is the commercial center of the Albemarle section, where the customs are received, Federal courts are held, and where in a few weeks the Government will begin the erection of a custom-house to cost $140,000. It has waterworks, electric lights, sewerage, paved streets, telegraph, short and long distance 'phones, and every convenience of a modern and up-to-date city. We have one railroad connecting us with the North and the South, and within three months from this date the Elizabeth City and Western Railroad will afford us means of exchanging our products for those of the far West, and thereby increase our trade and commercial importance. Numbers of steamers, barges, and sailing vessels connect Elizabeth City with the country bordering on the Albemarle and Pamlico sounds and their tributaries, while the inhabitants of nine counties in eastern North Carolina make this their trade center. Retail and wholesale houses, cotton and knitting mills, numerous manufacturing enterprises, and three banks make this the metropolis of eastern North Carolina. In addition to the products of the soil, namely, cotton, grain, truck, etc., Elizabeth City has an inexhaustible supply of fish and oysters from the waters of our various sounds and bays, forming an inland basin, exceeding in extent any in the United States except the Great Lakes.

The statistics hereto attached and made a part of this report show a tonnage of 699,172 tons, with many articles omitted that might have been included; and it also shows that on the articles named not less than $200,000 per annum could be saved in freights by means of deep-water transportation by large barges. While the report is not as thorough, comprehensive, and intelligent as we would desire it, yet we trust it will serve its purpose in aiding you and your colaborers in securing from Congress at an early date an appropriation sufficient for the construction of this inland waterway, which is certainly the most important and commendable enterprise looking to the development of the Atlantic, and, we may also add, the Pacific seaboard, through the proposed isthmian canal, that has engaged the attention of Congress for the last quarter or a century.

Most respectfully, yours,

EDMUND ALEXANDER,
Chairman Committee on Commerce.

Col. CHARLES J. ALLEN, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va.; to Beaufort Inlet, North Carolina.

Freight statistics of Elizabeth City, N. C., for year 1902.

[Prepared by the Elizabeth City (N. C.) Chamber of Commerce, Edmund Alexander, chairman committee on commerce, for the purpose of showing the net gain in reduced freight rates to be derived per annum by establishing the proposed inland waterway from Norfolk Harbor to Beaufort Inlet, North Carolina.]

Articles.	Packages.	Tons.	Reduction.	Gained.	Remarks.
Lumber	98,117,137	147,175	[a]$100.00	$98,117	Received and shipped from this port.
Piling ... pieces	50,000	25,000	[b].50	25,000	From Albemarle Sound via Elizabeth City, north.
Logs	70,735,000	282,947	....	....	For local trade and manufacturing.
Cooper timber ... cords	27,000	13,500	1.00	13,500	Do.
Shingles	15,500,000	33,250	.25	8,312	Manufactured here and shipped.
Brick	....	4,340	[c].75	3,255	Those received and those manufactured and shipped.
Grain	....	10,750	.50	5,385	Purchased by merchants and mill men here.
Fertilizer and lime	....	52,312	.50	26,156	Handled here.
Coal	....	8,600	.50	4,300	Received for home consumption.
Cotton seed	....	2,700	.50	1,385	Purchased in this section and shipped.
Bales of cotton	25,560	6,390	.50	3,194	Local and through cotton.
Hogsheads of tobacco	15,231	7,715	.50	3,807	In transit.
Mill and feed stuff	....	6,775	.50	3,387	Home consumption and distribution.
Oysters and green peas	110,000	3,380	.50	1,690	Canned here and shipped abroad.
Groceries and canned goods	....	17,782	.50	8,891	Local trade and for distribution.
Hay	....	8,000	.50	4,000	Do.
Salt, coffee, and sugar	....	1,580	.50	790	Do.
Bags peanuts	3,264	130	.50	65	Do.
Hardware, machinery, etc	....	390	.50	195	Do.
Farm implements	....	175	.50	87	Do.
Tar and oil ... barrels	6,000	1,500	.50	750	Do.
Egg crates	15,000	375	....	....	Do.
Barrels, potatoes	35,356	2,829	....	....	Local trade and for distribution for the north.
Packages truck	121,000	3,025	....	....	Mostly in transit for the north.

[a] Per thousand.
[b] Each.
[c] Per ton.

Freight statistics of Elizabeth City, N. C., for year 1902—Continued.

Articles.	Packages.	Tons.	Reduction.	Gained.	Remarks.
Packages of fish	55,000	5,500			Local trade and distribution.
Vessels of oysters	568	22,720			Local factories and in transit.
Vessel loads of melons	67	1,200			Local trade and in transit.
Dead and live stock	7,260	4,499			Do.
Fresh meats		250			Local trade.
Packages cakes, crackers	36,000	800			Local trade and distribution.
Dry goods	19,942	975			Local trade only.
Cord wood	6,600	3,300			Do.
Carloads furniture	105	225			Do.
Coops poultry	5,600	1,400			Mostly in transit.
Horses and mules	467	234			Local trade.
Empty barrels, crates, etc	326,114	1,624			Handled here.
Butter dishes	7,000,000	1,000			Manufactured here.
Knitting mill		2,500			Goods received and shipped out.
Cotton factory		334			Do.
Elizabeth City Electric Light Co.		2,000			Goods received.
Total		699,172		$213,876	

EXHIBIT K.

LETTER OF CITIZENS OF BEAUFORT, N. C.

JUNE 29, 1903.

DEAR SIR: At a mass meeting of the citizens of the town of Beaufort held in the town hall on the 3d day of June the undersigned were appointed a committee to secure data and statistics of the business, commerce, industries, and different enterprises of the town of Beaufort, and the county of Carteret, N. C., to be forwarded to you, in reference to the project of the inland waterway from Chesapeake Bay to Beaufort, N. C.

Beaufort is a thriving town on the eastern coast of North Carolina, the county seat of Carteret County. According to the last census, it has a population of 2,185; it is the third oldest town in North Carolina; was incorporated in the year 1722 as a port of entry by the English Government; it has a fine natural harbor, and notwithstanding the fact that it has never been deepened by the Government, yet vessels drawing 14 and 15 feet of water can come in with safety. Vessels have entered this harbor in the past drawing as much as 25 feet of water; in fact Beaufort Harbor was the rendezvous of the United States fleet in 1864, in charge of General Butler when the attack was made on Fort Fisher, and also the later one in charge of General Terry. This latter fleet contained near 300 vessels. By a reference to a recent report of the United States engineers in regard to the Beaufort Harbor, it can be seen that with an outlay of from $60,000 to $100,000 the harbor can be deepened so that vessels drawing 25 feet of water can come into our port.

The town of Beaufort is only about a half-hour's run from the sea, and the harbor is landlocked on all sides, and makes a good refuge for vessels from storms in any and all directions.

The county of Carteret is a very fertile county. The principal industries are fish, oysters, clams, and other sea products; farming, trucking, timber interests, etc.

The Gulf Stream is within 19 miles of our coast, and owing to its nearness truck and early vegetables can be raised at least two weeks earlier than they can be raised within 30 miles in the interior. Our soil is capable of raising cotton, corn, hay, rice, potatoes, vegetables, and numerous other products.

There was listed for taxation in June, 1902, in the county 157,903 acres of land; 1,956 town lots. The aggregate value of the real and personal property was, in round numbers, $1,000,000. The report from the custom-house for the port of Beaufort shows 225 registered vessels, with a gross tonnage of 2,675 tons. There are at least eight times as many smaller craft, which are engaged in commerce in the county, not registered in the custom-house, they being under custom-house tonnage. The amount of the gross sales of the merchants in Carteret County for the year ending December 30, 1903, aggregates in round numbers about $1,000,000; the amount of gross sales for the town of Beaufort aggregates $200,000; the number of vessels engaged in the oyster business in the county, dredgers, 54; smaller craft, 1,000. The number of licenses issued for oystermen for the year ending 1902 was 766.

The different commodities handled in the county for the year ending December 31, 1902, were as follows:

Cotton	bales	2,500	Oysters	bushels	1,000,000
Cotton seed	bushels	7,500	Turpentine, crude	barrels	1,000
Tobacco leaf	pounds	25,000	Clams	bushels	75,000
Rice, rough	bushels	2,000	Wood	cords	200,000
Grain	do	100,000	Timber	feet	25,000,000
Hay	tons	100	Lumber	do	20,000,000
Potatoes	bushels	200,000	Shingles	number	1,000,000
Vegetables	pounds	1,000,000	Fertilizers	tons	10,000
Cattle	head	2,000	Machinery	pounds	100,000
Horses	do	3,000	Merchandise, general	tons	500,000
Hogs	do	5,000	Passengers	number	20,000
Poultry	do	50,000	Coal	tons	1,000
Eggs	dozen	500,000	Peanuts	bushels	10,000
Fish	pounds	60,000,000	Fish oil	barrels	10,000

In gathering the above statistics the committee have in some instances been unable to get definite figures and have had to estimate the same. The estimates are very low.

With the inland waterway we feel confident that this business would increase treble.

All of which is respectfully submitted.

J. H. Potter,
C. P. Dey,
W. T. Chadwick,
W. F. Dill,
C. D. Jones,
J. S. Caffrey,
Chas. L. Abernathy,
Committee.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

Exhibit L.

LETTER OF THE WASHINGTON (N. C.) BOARD OF TRADE.

July 16, 1903.

Dear Sir: We, the undersigned committee appointed by the Board of Trade of Washington, N. C., to make investigation into the commercial condition of Washington and its contributory territory and to procure data showing the probable benefits to accrue to Washington and vicinity from the construction of the proposed 16-foot waterway from Norfolk Harbor to Beaufort Inlet, North Carolina, beg leave to offer the following information, which we trust will be of some assistance to your honorable Board in your consideration of this matter:

We have made a careful and, we believe, an accurate calculation of the tonnage of freight handled during the calendar year 1902 in Washington and on Tar and Pamlico rivers and tributary waters. The conclusions we have reached are not in any instance merely opinions or the results of guess, but are in every instance the results of definite investigation and admit of indubitable proof. The following table gives the tonnage, distributed among the various classes of commodities:

	Tons.		Tons.
Cotton	18,703	Salt fish	214
Cotton seed	23,277	Dead and live stock	2,438
Cotton-seed oil	8,020	Timber	363,897
Cotton-seed meal	10,292	Lumber	289,430
Cotton-seed hulls	988	Shingles	5,693
Potatoes	31,905	Cord wood	10,716
Vegetables	8,774	Fertilizers and lime	42,260
Chickens and eggs	1,408	Oyster shells	6,250
Fresh fish	4,786	Juniper logs	2,985

	Tons.
Cedar logs	58
Piles	12
Leaf tobacco	1,371
Hay	4,093
Rice, rough	532
Grain	40,702
Meat	1,227
Oysters and clams	24,194
Coal and coke	8,276
Tar, rosin, and turpentine	1,119
Peanuts	387
Oil	3,693
General merchandise	53,560
Ice	1,928
Brick	1,577
Empty barrels	305
Wool, hides, bones, etc	41
Total annual tonnage	975,111

On account of the fact that the shipments were made to and from various points, the freight rates therefore presenting wide differences, it was difficult to compute accurately the amount of freight charges that were paid on the above tonnage. We selected as the fairest basis of discussion in some cases the steamer rates between Washington and that point from which or to which the bulk of the tonnage of each article was shipped; and in other cases an average of the steamer rates between Washington and the several points from which or to which the shipments were made. We found that the total freight charges on the above total tonnage for the past year of 1902 were $2,011,035.

We believe that the chief advantages of the proposed waterway to our territory would lie in the extension of barge transportation with its very low freight charges and the influence of the cheap rates made possible by such transportation in lessening the existing freight rates. Any statement of what would be the amount of the reduction in freight charges that would follow the extension of barge transportation would be largely conjectural, but we are sure that we are well within the limits of probability when we claim that the present existing freight rates would, under such conditions, be reduced by at least 33⅓ per cent. Every article in the above table would be possible freight for the barges or would be subject to the reduced rate, with the exception of potatoes, vegetables, and fresh fish, which require quicker transportation than barges or steamers could furnish, and of ice, the most of which is used by the fishermen in these waters. Deducting the present freight charges on those four articles from $2,011,035, the total freight charges on the entire volume of business done last year, the remainder is $1,760,372, which represents the amount to which the reduction could properly be applied. Therefore the yearly saving in the present business through the cheaper rates would be one-third of $1,760,372, or $586,791.

In this calculation of freight reduction it is eminently proper to include the increased business which is being secured by the plants and other agencies now in operation, gained mostly by the growth in the population of Washington and its vicinity, and by a healthy expansion of her trade. To what this increase would amount within a few years must necessarily be a matter of opinion, but no one acquainted with the existing commercial conditions of this community would hesitate to make the prediction that before the proposed waterway could be completed the trade of Washington and the territory covered by this report would be increased by 50 per cent at the lowest estimate. Therefore, again excepting potatoes, vegetables, fresh fish, and ice, the additional freight charges on the increased business would amount at the present rate to one-half of $1,760,372, or $880,286. At the reduced freight rates the saving on that increased business, at the same ratio of reduction, amount to one-third of $880,286, or $293,428.

One heavy tax upon a certain portion of the business of Washington is the tolls levied on the commerce which is carried through the privately owned canals connecting Albemarle Sound with Chesapeake Bay. At the rate of 40 cents per 1,000 feet the tolls collected on the lumber given in the above table amount annually to $77,181. Fertilizers, coal, and grain are also handled through those canals in the same manner as lumber on barges. We are not informed what are the rates on those commodities, but are positive that they can be no lower than the rate on lumber. Assuming that rate for the purpose of this discussion, the tolls on those classes of goods would amount to $21,170 per annum. Therefore the tolls on the goods which are already transported by barges amount to $98,351 per annum.

The following brief table then shows the pecuniary benefits to Washington and its territory that would follow the construction of the proposed waterway:

Amount gained by freight reduction on present business	$586,791
Amount gained by freight reduction on extension of present business	293,395
Amount gained by abolition of tolls	98,351
Total amount gained annually	978,537

We wish it to be observed that the above calculation is based only on the present business and its healthy expansion within a few years. We have, of course, no figures to offer in demonstration, but we should like to ask you to consider the great possibilities in the inauguration of new enterprises, the opening up of new fields for our trade, and the diversion of other freight through these channels. We can merely allude to a few of these possibilities.

The principle is becoming firmly established in the industrial world that the factories must seek the raw material. We may therefore expect to see the establishment erected to dress our pine and prepare it directly for the carpenter in the forms of doors, sashes, blinds, ceiling, molding, etc.; to see furniture factories built in our midst, and other plants to use the hard woods, which have not been exploited in this section; to see additional oyster canneries and, what would be of greater financial benefit to our country, vegetable and fruit canneries, which would supply a market for more remunerative crops; to see textile enterprises, which would manufacture our raw cotton into the finished products; to see pulp factories to use our native woods, and to see tobacco factories. It is probable that the shipbuilding industry will grow to great proportions, through the presence of sufficient depth of water and of the necessary timber and the existence of cheap freight rates on the other materials.

Washington already enjoys an extensive wholesale trade with a considerable part of North Carolina. The presence of the deep waterway would greatly increase her superiority over the inland cities in freight rates; and with the completion of other railroads to this point, which would naturally and surely come to seek the deep water, she would have unsurpassed opportunities to find and hold far wider fields of trade. Under such conditions, there is no reason why Washington should not eventually do the wholesale business for one-half of the State.

One strong reason for the construction of this waterway is that North Carolina practically has no seaports, her magnificent stretch of coast being rendered useless, as well as dangerous, commercially, by the long, low sand dunes and the contiguous shoals, extending in many places several miles out to sea. The construction of the waterway would furnish two safe outlets to the ocean and at once put our ports in touch with foreign countries, rendering very valuable our wide expanse of navigable sounds and streams for commercial purposes. We could then resume the old West India trade, which made the town prosperous in the antebellum days, and could carry on a good direct trade with our southern neighbors.

The presence of such deep waterway, with its accompanying low freight rates, would unquestionably divert through its channel great quantities of freight which now seek other channels of transportation. There is no reason why the bulk of the commerce of all the territory lying on both sides of the Tar River, up to and beyond Tarboro, should not be brought down through Washington, to follow this water route, as all the arguments to prove freight reduction for Washington and vicinity will apply with equal force to all that territory up the Tar River; and the same results in progress and increased business may be expected in one as in the other. In comparison with the savings in freight rates on this increase of commerce, which we believe would be eventually the direct result of the proposed waterway, the figures herein given showing the savings on the present business, pales into insignificance.

We append hereto a letter from Messrs. Wm. Bragaw & Co. and a letter from Mr. George T. Leach, both of whom on account of their business are conversant with the matters which we have discussed.

Geo. T. Leach,
J. M. Gallagher,
Harry Howell,
Committee.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

LETTER OF THE EUREKA LUMBER COMPANY, WASHINGTON, N. C.

July 28, 1903.

Dear Sir: While I am a member of the committee appointed by the Board of Trade of this town to furnish you with the data contained in the accompanying report of said committee, I desire to supplement the report with a view of emphasizing the importance to this section of the construction of the inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

I would lay stress upon one paragraph in the report of our committee discussing "the dangers of our coast, and the practical absence of seaports." If we had nothing else to urge in behalf of the project this ought, in my judgment, to be a sufficient reason to commend it to the favorable consideration of Congress and to justify the expenditure. Its construction would give all of eastern North Carolina a free waterway to the north by way of Elizabeth River and Chesapeake Bay, and a similar outlet to the ocean on the south by way of Beaufort Inlet.

I refer more particularly to the section of country in eastern North Carolina which would be interested and with which I am most familiar. It would greatly promote the coastwise commerce of all the ports to the south, such as Wilmington, N. C., Georgetown and Charleston, S. C., Savannah and Brunswick, Ga., and Jacksonville and Fernandina, Fla., and also Norfolk and Baltimore, which I am sure has been fully realized by these respective cities and which I am informed have presented exhibits illustrating its importance to their respective sections.

While North Carolina fronts upon the ocean, yet she has substantially only two inlets worthy of the name, those at the mouth of the Cape Fear River and at Beaufort Inlet, while north of the latter inlet, comprising the greater part of the coast line, there is no outlet to the ocean which can be utilized for commercial purposes. Ocracoke Inlet is the only one on this part of the coast line which offers sufficient depth, and the entrance to this from Pamlico Sound is obstructed by a bar or "swash" from the sound side, having only a depth of about 7 feet. In addition, this coast line between Beaufort and Cape Henry is unquestionably the most dangerous along our entire coast, Cape Hatteras and Diamond shoals standing out preeminently as the most forbidding menaces to navigation. This coast line consists of a narrow strip of land, mostly sand dunes, between which and the mainland are capacious sounds with ample depth of water for the most part, Pamlico and Albemarle being the largest, into which flow a number of bold, navigable rivers. Beaufort Inlet can not be reached from these sounds, owing to the shallow water in Core Sound, which intervenes, and there is, therefore, no outlet to the south. The only outlet toward the north is through two canals, one known as the Albemarle and Chesapeake Canal and the other as the Dismal Swamp Canal, which are owned by private corporations and which necessarily levy a toll upon all the water-borne commerce from this large section of eastern North Carolina. These canals claim to have a minimum depth of 9 feet, and can therefore only accommodate vessels of a maximum draft of 8 feet.

I would direct your attention briefly to this section of eastern North Carolina, upon whose water-borne commerce nature has apparently laid an embargo, and to some of its thrifty towns and cities. The first south of Norfolk is Elizabeth City with a population of about 10,000, situated on Pasquotank River, about 17 miles from its mouth, and which river empties into the Albemarle Sound. I know something of the thrift and growth of this city, and I have had the pleasure of reading the compilation of data as to its trade, and it justly deserves the reputation of being among the most progressive. The town of Hertford, with about 1,400 inhabitants, is situated on the Perquimans River. Edenton, with about 3,000 inhabitants, is situated near the mouth of the Chowan and on the beautiful bay of Edenton. Columbia and Creswell are on the Scuppernong River, the bar of which at its mouth has recently been dredged which, in itself, will offer inducements for the growth of its trade. Plymouth, Williamston, Hamilton, and Jamesville on the Roanoke, and Windsor on the Cashie, are all prosperous towns. All of these rivers named have their outlet in Albemarle Sound, which, by the way, is the largest body of fresh water east of the Great Lakes. Farther south, and situated on the Pamlico River, is the town of Washington, my adopted home. This town at the last census, of 1900, contained a population of 4,800 and has to-day not less than 7,000. As indicative of its rapid growth, it may be said that the post-office in this town has recently been raised to second class, and within the past three years more capital has been invested in buildings and manufacturing enterprises, and greater provision has been made for public schools, than in all its past history.

The town of Belhaven, near the mouth of Pungo River, a tributary of the Pamlico, is one of the most progressive of the new towns. Its population has almost trebled since the last census, and its growth in manufacturing has also been remarkable. It is the southern terminus of the Norfolk and Southern Railroad, and must become a large town in the near future. The city of Newbern, on the Neuse River, has a population of about 12,000, and has for years been maintaining a steady growth both in population and manufacturing, and has every promise of continued progress. Both the Pamlico and Neuse rivers empty into Pamlico Sound. I have not mentioned other prosperous towns and villages in all this section of the State, many of which have been established within the past ten years, and which contain valuable plants for the manufacture of lumber and for the conversion of other raw products, present in abundance. Agriculturally this section has some of the most fertile lands to be found anywhere, and as a whole they will compare favorably with the most favored section of the entire country. While the manufacture of lumber has been active in this section for some years, there are still valuable timber lands which have not been exploited, and which await the coming of labor and capital. In addition, these large sounds and rivers all afford an abundance of the varieties of fish, and contain perhaps the largest area of natural oyster grounds to be found in the world.

This entire section, with its progressive urban population, its manufactured products, together with the products of the soil and its unlimited possibilities in agriculture, is all tributary to large navigable rivers and sounds, which should make possible a large water-borne commerce. As stated, this commerce has no outlet except to the north and through the two canals mentioned, of insufficient capacity and depth.

Who will say that in the promotion of our internal commerce which has been undertaken by the National Government that this section does not deserve more generous treatment than it has received by the opening up of a capacious waterway to the outside world, which should be absolutely free to commerce. Such a project has been discussed for years, and no man yet has had the temerity to deny its merits or to doubt the possibilities of commercial growth which would follow the construction of a such a waterway. It would be difficult to find a section more favored in natural resources and which has suffered more greatly from the neglect of the General Government. Instead of being content with occasional appropriations for the deepening of these streams which flow into the sounds of eastern North Carolina, let the Government at once furnish an outlet to the outside world for the existing and prospective commerce of eastern North Carolina, and the situation will be so far solved that other and local improvements will follow as a matter of course. Neither the railroads nor any other existing method of transportation will suffer from the construction of such a waterway, but other interests will be benefited from the increased growth and prosperity which will follow.

All of the foregoing considerations, and others which might be urged, demonstrate the wisdom of one of our greatest soldiers and patriots, General Grant, who, in one of his messages to Congress, urged its speedy construction.

I submit the above, with great deference, to the Board of Engineers having this inland waterway under consideration, because I conceive it to be the duty of every citizen to contribute something, however humble, to the consummation of this great project in which is involved so much of the commercial growth not only of eastern North Carolina but to our entire Atlantic seaboard.

Very respectfully,

Geo. T. Leach,
President Eureka Lumber Company.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

LETTER OF MESSRS. WILLIAM BRAGAW & CO., WASHINGTON, N. C.

July 14, 1903.

Dear Sir: We are asked to furnish statistics and to express a conservative opinion concerning the proposed "inland waterway" and its results upon commerce and the community.

That is a large question. Few of us, perhaps, have yet realized the importance of this subject and the perfection thereof to the Atlantic States. It should enlist the attention and active efforts of all alike, for this is an enterprise that will benefit immeasurably the citizens of the interior of these States, as well as those of the coast counties.

As to Washington, N. C., from data gathered by us hitherto but now available, there is no doubt that this town's "in and out" tonnage amounts to 650,000 to 750,000 tons per annum.

We believe that within five years this tonnage through the inland waterway would increase 25 to 50 per cent, aside from the otherwise natural growth.

We believe that business and property values of every description hereabout would be enhanced in nearly the same ratio.

Obviously freight rates per water routes easily may be lower than per rail. The inland waterway by the increased transportation facilities which it will provide will open the way to enlargement of the interchange of freight traffic between the people of the coast and those farther up the State.

To-day there are goods sold by merchants here to points as far west as Raleigh, Durham, Greensboro, etc., in direct competition with the larger interior centers. This development, after the inland waterway is an established fact, can be pushed to tremendous proportions, and since Washington can compete in those interior points will not the benefit be mutual and larger as the business grows? Surely so.

As we see it, no one section will have an advantage over another, therefore it is to the advantage of all to second the efforts for the beginning of this work.

To say nothing of increased values and enlarged business, it seems to us that the saving in freight cost alone will justify the undertaking, and would more than equal interest on the investment. We estimate that the freight cost would be reduced about 25 per cent, perhaps more.

We believe our own private business would be benefited 100 per cent by the waterway.

Yours, truly,

Wm. Bragaw & Co.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

Exhibit M.

LETTER OF THE BEAUFORT (S. C.) BOARD OF TRADE.

July 18, 1903.

Dear Sir: Though blessed by nature with the finest deep-water port south of Hatteras, Port Royal's advantages have not been utilized, and as a consequence her commerce as compared with her sister ports is small; whatever the reason for this it is not due to lack of water on the bar nor anchorage room in the roads, as the records of the port will show that not only is the harbor capable of giving shelter to a naval fleet, but that large flotillas of naval vessels have from time to time been safely anchored in the broad waters of its bay.

This merely shows that, with the development of the coastwise and foreign commerce that is bound to follow the development of the interior country, Port Royal will be prepared to handle her share of the growing commerce.

In the interest of the projected inland waterway, or barge canal, from Chesapeake Bay to Beaufort Inlet, North Carolina, Mr. C. H. Forrest, of Baltimore, appeared before the Beaufort Board of Trade.

Beaufort, being the port entry for Port Royal and St. Helena entrances, and a thriving town, is interested in this project. Our present traffic for the year ending November 1, 1902, consisted of—

	Number.	Registered tonnage.
Foreign (steamships)	35	97, 384
Coastwise (vessels)	46	26, 042

This port will enjoy a largely increased trade with cheaper and safer communication with northern ports. Experience has shown that where canals have been opened not only has the existing commerce been largely augmented, but new avenues of trade have been developed and vessels of new or improved types have been built, not only adding to the commercial importance of the cities affected, but to the general prosperity of the whole country as well.

The people of Beaufort now have inland communication with the neighboring cities, and it would require an outlay not at all excessive to make this inland waterway deep enough and wide enough to accommodate vessels of much greater tonnage than those now in use. This deepening and widening we hope will follow close on the heels of such an important undertaking as the barge canal.

In both of these projects Beaufort would be benefited by the added importance of the naval station at Port Royal. This naval station, which holds an important place as a naval base for vessels en route to and from our new West Indian possessions, and which Admiral Bradford says "offers superior advantages as a coaling station," would be rendered easily accessible by torpedo boats and small cruisers, which would escape the delays and dangers of Cape Hatteras on their way to Port Royal from Norfolk.

The advantage of such a waterway to the Navy in time of peace, and, through the Navy, to the whole country in time of war, can not be stated in dollars and cents, but it would no doubt many times exceed the saving on the commercial side.

Wm. P. Waterhouse,
Secretary Beaufort Board of Trade.

Col. Charles J. Allen, *Corps of Engineers, U. S. Army,*
President of the Board of Engineers having under consideration the project of an inland waterway from Norfolk, Va., to Beaufort Inlet, North Carolina.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

The Board of Engineers for Rivers and Harbors,
Washington, D. C., February 9, 1904.

General: Inviting attention to indorsement of this date, returning to the Chief of Engineers a report submitted in compliance with the river and harbor act of June 13, 1902, by a Board of Engineers, on an examination and survey of "waterway from Norfolk, Virginia, to Beaufort Inlet, North Carolina, with a view to the construction of a channel not less than sixteen feet in depth, upon the most advantageous route between the points named," the Board of Engineers for Rivers and Harbors has the honor to submit the following report:

The proposed improvement is, in effect, a 16-foot tidal canal from Norfolk, Va., to Beaufort Inlet, North Carolina, having a total length of 194.1 miles, with bottom widths varying from 90 feet through dry land to 300 feet in the open sounds. Portions of the route lie in natural waterways affording the desired depth, so that excavation would be required for a length of only 128 miles. The estimated cost is $10,023,000, with an annual charge of $150,000 for maintenance, or a total annual cost of about $450,000, allowing 3 per cent on investment.

The construction of this waterway is urged on three grounds, viz:

(a) For local commerce, to furnish an outlet from the sounds of North Carolina and their tributaries.

(b) For coastwise commerce, to provide a protected channel in lieu of the more hazardous open ocean route past Cape Hatteras.

(c) For military purposes.

The present outlets for the local commerce are by way of the Dismal Swamp and the Albemarle and Chesapeake canals and their approaches. These canals are in the hands of private corporations, but the approaches have in each case been improved by the United States. The present available depth of channel is 9 feet by either route, though a depth of 10 feet has been provided in the approaches to the Dismal Swamp Canal. The United States had expended $251,196.46 on the Dismal Swamp Canal route and $290,456.69 on the Albemarle and Chesapeake Canal route prior to June 30, 1903.

The present local commerce via the competing Dismal Swamp and Albemarle and Chesapeake canals amounts to 400,000 tons annually, upon which tolls are collected amounting to $100,000. It is highly probable that with the elimination of tolls and the creation of a 16-foot waterway in place of the 9-foot existing channels, there would be a great saving to this existing commerce and a large increase in its volume. For purposes of argument, it may be admitted that the saving to the community on this local commerce would be at least double the tolls now collected, or $200,000 annually.

A large commerce, carried in light-draft "Bay" steamers, now exists between Baltimore and Chesapeake Bay points, including the tributary rivers of Virginia and Maryland. It is readily seen that were the waterway under consideration provided, this commerce would be extended to the sounds of North Carolina, and perhaps to certain Atlantic ports farther south. The Board has no data enabling it to form an estimate of the probable growth in commerce of this character.

The present coastwise commerce between the North and South Atlantic ports is carried in sailing vessels and steamers, neither of which classes would probably make large use of the proposed waterway. Ocean transportation is generally cheaper than that by canal. Boats built for ocean traffic are not apt to forego the advantages of ocean navigation in order to use a parallel inland waterway of such restricted dimensions. If the weather were fair, a sailing vessel bound south, especially from a port north of Chesapeake Bay, would undoubtedly pursue the shorter and quicker route outside. Under other circumstances it is questionable whether the protection offered by the canal would offset the hazards of entering between the capes of the Chesapeake during stormy weather and the expense of towage through the canal and loss of time. On the other hand, steamers could hardly use the canal, as a depth of about 20 feet would be required to accommodate steamers similar to those now plying coastwise between the North and South Atlantic ports.

If the proposed channel is to become a commercial success commensurate with the great expenditures involved, it is generally admitted that this result must be largely brought about through changes in methods of transportation and the development of barge navigation between Chesapeake Bay, including points to the north thereof, and South Atlantic, Gulf, and Caribbean Sea ports. An examination of the papers submitted by the interested parties shows that they lay great stress on the cheapness of barge navigation, and the benefits expected from the waterway are estimated on the assumption that existing and prospective coastwise commerce would be mainly carried in this manner.

Barge navigation has been very largely developed on the North Atlantic coast, but is considered impracticable from Norfolk southward on account of the dangers of Cape Hatteras and the great length of coast without any harbor to serve as place of refuge. When it is extensively used, however, the ocean-barge navigation is largely confined to the movement of coal, and the Board is of the opinion that such a system of transportation is not especially suited to any part of this southern coastwise commerce except that in coal and lumber.

The following table has been prepared from information contained in publications of the Department of Commerce and Labor, Bureau of Statistics, showing recent movements in coal.

Coal movement to southern ports during eleven months ending November 30, 1903.

[Tons.]

Received at—	Received from—				
	New York.	Philadelphia.	Baltimore.	Newport News.	Total.
Savannah, Ga		42,113	24,294	10,904	77,311
Jacksonville, Fla		17,523	5,023		22,546
Mayport, Fla			1,783		1,783
Key West, Fla		7,547	5,455		13,002
Elizabeth City, N. C			440		440
Edenton, N. C			443		443
Charleston, S. C		25,470	10,600		36,070
Tampa, Fla		308			308
Ellsworth, N, C	2,244				2,244
North Carolina, miscellaneous ports	1,011				1,011
Florida, miscellaneous ports		18,157			18,157
Virginia, miscellaneous ports		23,331			23,331
Total	3,255	134,499	48,038	10,904	196,646

The coal supply of the Southern States is now largely drawn from the Alabama and Tennessee fields; from Pennsylvania via the Ohio and Mississippi rivers; from Indian Territory, and from the Virginia and West Virginia fields. Beginning with Texas, it is found that the principal coal supply is drawn from Indian Territory, although there is a market for water-borne coal, principally from the Alabama field, via Pensacola, in the immediate vicinity of Galveston and Sabine Pass. Mississippi River points are largely supplied by coal barged down from Pennsylvania. Mississippi, Alabama, and large parts of Georgia and Florida, are supplied from the Alabama field. Parts of North and South Carolina are most economically supplied by rail from the Appalachian field. It appears, therefore, that the principal coastwise coal business between the North and the South will be limited to the supply of a fringe of coast country from Norfolk, Va., to Miami, Fla., and at many points along this coast there may be expected in the future more and more competition from rail-borne coal.

There is a considerable export coal trade from northern ports that passes close to Cape Hatteras. In 1902, the following coal shipments have been noted:

	Long tons.
To Mexico	552,921
To British West Indies	159,085
To Danish West Indies	79,743
To French West Indies	69,079
To Cuba	396,744
To Brazil	43,657
To Colombia	49,293
Total	1,350,522

The statistics of lumber shipments coastwise past Cape Hatteras are not readily accessible. It is known, however, that 384,043,333 feet B. M. of southern pine was received at New York alone from coast points south of Cape Hatteras during the forty-seven weeks of 1903 preceding November 42. In the Report of the Chief of Engineers for 1902 it is stated that 961,743 tons of lumber, valued at $12,661,662, was received at Philadelphia from coastwise vessels during the year ending December 31, 1901. What proportion of this lumber came from the South is not known, but it is probably large.

It may be assumed that not less than 4,000,000 tons of coal and lumber pass Cape Hatteras annually in the coastwise and export trade.

The question is whether the transportation of this amount, or any considerable portion of it, would be diverted from present carriers to barge lines using the proposed waterway.

Freight rates upon coal and lumber between certain points are quoted below from publications of the Bureau of Statistics, and the accompanying papers.

Coal:		
From Philadelphia to Charleston	per ton	$0.90 and $1.00
From Philadelphia to Georgetown	do	1.00
From Norfolk and Newport News to Charleston	do	1.00
From Norfolk and Newport News to Georgetown	do	1.00
Lumber (in cargo lots):		
From Brunswick, Ga., to New York	per M	5.625
From Jacksonville, Fla., to New York	do	5.875 to 6.00
From Charleston, S. C., to New York	do	6.00
From Charleston, S. C., to Philadelphia	do	5.25
From Charleston, S. C., to Baltimore	do	5.25
From Wilmington, N. C., to Baltimore	do	4.25

It appears from the accompanying papers that the Atlantic Coast Lumber Company, of Georgetown, S. C., has a contract with a line of steamers giving rates for lumber as follows: $2.75 per M to Baltimore and Philadelphia; $3.50 to New York, and $3.75 to Boston.

The cost of barge transportation of coal is, under some circumstances, but little, if any, less than transportation by schooner. For example, from a communication recently received by the Board from the secretary of the Galveston (Tex.) Chamber of Commerce the following is quoted:

> Anthracite coal is received almost entirely from Philadelphia via schooners. Bituminous coal is received from Virginia, West Virginia, and Maryland through the ports of Norfolk, Newport News, and Baltimore, and also via schooners; from Alabama through the ports of Pensacola and Mobile via steamers and barges; from Arkansas and Indian Territory mines via rail. * * *
>
> Our entire supply of coal for domestic and steamship use is now received from Atlantic seaboard and Alabama via water to the exclusion of coal from Arkansas and Indian Territory points.
>
> Steam coal received by water can not be shipped to any interior points at all on account of the availability and cheapness of fuel oil and coal from Arkansas and Indian Territory points. Anthracite and blacksmith coal can be shipped freely all over Texas, and in small quantities to points in New Mexico and Arizona. At present the freight rate from Philadelphia, Baltimore, and Newport News does not greatly exceed $1.25 per gross ton, net, to vessels, but this is an unusually low rate, and $1.65 per ton would be nearer a fair estimate. From Pensacola and Mobile the rate will average about $1 per ton. * * *

Thus it is seen that the rate per-ton mile is very much less for schooner-borne than for steamer-and-barge-borne coal to Galveston, Tex.

A consideration of freight rates on coal between New York or Philadelphia and New England points by barge transportation, as compared with rates to South Atlantic ports by schooners, renders it very doubtful whether any extensive system of barge transportation would be developed, and convinces the Board that no such saving would follow the elimination of the dangers of Cape Hatteras as would justify the great cost of constructing the proposed waterway.

To sum up the commercial advantages of the route in question, it appears to the Board that a 16-foot waterway would save say $200,000 annually upon the commerce now following the canals that lead southward from Norfolk, stimulated as such commerce would be by the elimination of tolls and increased channel depth. The extension of trade of the "Bay" steamers, plying from Baltimore, would result in savings to the public that can not be exactly stated. The development of an extensive barge system of transportation is a mere possibility.

The military value of the proposed waterway is undoubted, but by no means a constant quantity. In the days of a small Navy, containing many light-draft monitors, built primarily for coast defense, the value of the route was greater than now, when our naval strength is coming to be measured in battle ships and armored cruisers of deep draft, capable, under some circumstances, of seeking the enemy on his own coasts, and compelled to defend possessions remote from our own seaboard. As far as naval progress can be anticipated by the Board, the value of a 16-foot waterway between Norfolk and Beaufort would be less when the work were completed than it would be now. And its present military value is mainly as a protected interior route for torpedo boats and torpedo-boat destroyers. Inasmuch as these craft draw no more than 6½ feet, it would be entirely unnecessary to provide a 16-foot waterway for them.

Comparing the cost with probable commercial and military advantages, and having in mind also the necessity for large appropriations for projects already contracted elsewhere, the Board is of opinion that it is not now advisable to undertake the construction of a waterway from Norfolk, Va., to Beaufort Inlet, North Carolina, with a channel not less than 16 feet in depth. The study given by the Board to the question of this proposed improvement has convinced it that a waterway between the termini mentioned in the act, free of toll and with a depth of from 10 to 12 feet, would be of great advantage to traffic originating in or destined for the eastern portion of North Carolina, and would at the same time afford important military advantages. As the surveys have been made and the report of the original Board has been rendered upon the assumption that no consideration of a channel of less depth than 16 feet was desired by Congress, the Board is not in possession of data enabling it to report intelligently upon the proper route for or the estimated cost of such a waterway.

The Board recommends that a new inquiry be initiated by Congress with a view to ascertaining the best route and the cost of channels 10 and 12 feet deep, respectively, and of suitable width, between Norfolk, Va., and Beaufort, N. C., with a view to determining the advisability of undertaking a channel of either of the depths mentioned.

Respectfully submitted.

A. M. MILLER,
Lieut. Col., Corps of Engineers.
R. L. HOXIE,
Major, Corps of Engineers.
H. C. NEWCOMER,
Captain, Corps of Engineers.
W. V. JUDSON,
Captain, Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

L 15.

MODIFICATION OF HARBOR LINES AT "THE HAGUE," IN SMITH CREEK, NORFOLK HARBOR, VIRGINIA.

[The Norfolk Company—The Ghent Company.]

NORFOLK, VA., *April 24, 1903.*

SIR: Inclosed you will find tracing[a] of what is known as "The Hague," with surrounding streets, located in the center of the property of my two companies. This "The Hague" was made out of a marsh running through the center of our property about twelve years ago. My companies are desirous of filling up the portion marked in blue, with a view of making a garden out of such filled portion corresponding to three similar blocks just north of same. At the present time this portion of "The Hague" is nothing but a shallow basin, not serviceable for navigation, and an accumulation of filth and refuse is constantly deposited there by the tide.

My companies own all of the surrounding lots, and the proposed improvement is regarded as very desirous by such authorities as we have discussed the matter with. You will find the plan approved by the board of harbor commissioners, and I am informed that authority is also needed from your Department. I had a talk with Major Quinn, who at present represents the office of United States Engineers, and he will no doubt approve the proposed work when your Department submits the proposition to him. As I understand that he has been transferred to Savannah and expects to leave here in the next few days, I will appreciate very much if the matter above referred to could be submitted to Major Quinn as early as possible.

Very respectfully,

J. P. ANDRE MOTTU,
General Agent.

To the honorable SECRETARY OF WAR,
Washington, D. C.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 27, 1903.

Respectfully referred to Lieut. Col. J. B. Quinn, Corps of Engineers, for early report.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., May 18, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

This matter was turned over to me by Lieutenant-Colonel Quinn with the other matters relating to this office. He informed me that there seems to be some opposition to the proposed change of harbor lines coming from some of the citizens of this locality, and suggests that I obtain the authority of the Department to have a public hearing in the matter. In accordance with this suggestion, I hereby make request for the authority.

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[a] Not printed.

E. Eveleth Winslow,
Captain, Corps of Engineers.

[Fourth indorsement.]

Office Chief of Engineers, U. S. Army,
May 20, 1903.

Respectfully returned to Captain Winslow, who is authorized to hold a public hearing for the consideration of this matter, as requested in third indorsement hereon.

To be returned.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Fifth indorsement.]

Engineer Office, U. S. Army,
Norfolk, Va., June 17, 1903.

Respectfully returned to the Chief of Engineers, United States Army, with accompanying report.

E. Eveleth Winslow,
Captain, Corps of Engineers.

[Ninth indorsement.]

Office Chief of Engineers, U. S. Army,
August 1, 1903.

Respectfully returned to the Secretary of War.

Application is made by the Norfolk Company and the Ghent Company for a modification of the harbor lines in a portion of Smith Creek, Norfolk Harbor.

The subject has been under consideration by Captain Winslow, who has held a public hearing at which all interested parties were offered an opportunity to present their views, and attention is respectfully invited to his report of June 17, herewith.

A change in the harbor lines is desired by the applicants in order that they may fill in and reclaim a small portion of the creek known as "The Hague," the land on both sides of the area to be filled being owned by the applicants.

While some opposition to the desired change has been manifested, Captain Winslow expresses the opinion that the interests of the parties making opposition will not be appreciably affected by the change. He further states that no riparian rights will be infringed, and that no interests of navigation will be injured by the filling which the applicants proposed to do, while, on the other hand, such filling would seem to be advisable for hygienic reasons. He accordingly recommends that the harbor lines be modified as requested, and as shown on the tracing[a] herewith submitted, it being understood that any bulkhead built on this line shall be substantially constructed in accordance with plans to be presented to the Department for approval previous to construction.

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[a] Not printed.

Attention is invited in this connection to the accompanying letter[a] from Mr. B. A. Colonna, who protests against the proposed change in the harbor lines on the ground that the filling is intended to enhance the value of private property and is in no sense for the benefit of the maritime interests of the port, which interests will be injured if projects of this kind are favored by the General Government.

Inasmuch as the project of these applicants has been approved by the local board of harbor commissioners, and as it does not appear that the small amount of filling would inflict any serious injury to the navigation of Smith Creek, I see no reason for the War Department withholding its consent; and I therefore concur in the views of Captain Winslow and recommend that the modified lines recommended by him be approved, and that the Secretary of War place his approval on the tracing which has been prepared for his signature.

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

[Tenth indorsement.]

War Department, *August 7, 1903.*

Approved as recommended by the Chief of Engineers.

E. Root, *Secretary of War.*

REPORT OF CAPT. E. E. WINSLOW, CORPS OF ENGINEERS.

Engineer Office, United States Army,
Norfolk, Va., June 17, 1903.

General: I have the honor to submit the following report upon the application of The Norfolk Company and The Ghent Company to have the harbor lines in a portion of Smiths Creek (Norfolk Harbor) altered, so as to permit them to fill in and reclaim a portion of this creek, known as "The Hague."

The company proposes to fill in a portion of "The Hague," and, in order to permit this, they desire that the harbor line at the end of "The Hague" be moved by about 300 feet, or one city block.

In accordance with the Department's fourth indorsement upon this application, I held at 11 o'clock a. m., on the 15th instant, a public hearing for the consideration of this matter. At this hearing, the following communications were opened and read: One from J. P. A. Mottu, representative of the companies, stating his reasons for the desired change in the harbor line; one[a] from W. T. Core, dated April 14, 1903, opposing the change; another[a] from W. T. Core, dated June 11, 1903, opposing the change; one[a] from G. T. Taylor, opposing the change. All the above-mentioned communications are inclosed herewith.

There were present at this hearing only Mr. Mottu, Mr. Dickinson, a resident of the locality in favor of the change, and some newspaper reporters; consequently, the matter was only informally discussed, and no stenographic notes were taken. Since this meeting, I have had a conversation with Mr. W. T. Core on this subject, and have received a communication[a] from Mr. Mottu, which is also inclosed.

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[a] Not printed.

I have had prepared, and inclose herewith, a tracing[a] of the portion of Smiths Creek affected by the harbor line adopted July 22, 1902, showing on the same the proposed alterations (K–L on map). The depths of water shown on this map are from a survey made in May, 1902, and, though no survey has been made since then, it is evident from observation that there has been considerable deposit in this creek, especially around its edges, there being at ordinary low water a strip of considerable width left bare, where this map shows depth of water as much as 3 feet. This filling is especially noticeable in "The Hague," there being shown on the map no area that should be bare at low water, while, in fact, as shown by an examination made since this matter came up, for 100 yards at the end of "The Hague" the entire area is bare, at low water, except a strip from 30 to 40 feet wide in its center, within which area the water is quite deep.

The flat thus left bare has had deposited upon it considerable filth, and I believe that in hot weather this filth would be disagreeable, even if it were not a positive menace to health. As there are no sewers emptying into Smiths Creek, except near its mouth, this matter must be brought into "The Hague" by the action of the winds and tides; and as from its very shape in the upper end of "The Hague" there would be very little circulation of water, even from tidal action, it would appear to be advisable, for hygienic reasons, that it should be filled in.

Within the limits of the proposed fill there is, at present, at low water, a water area of not exceeding 250 feet in length by 40 feet in width. The banks of this are quite steep, there being in some places as much as 12 feet of water. This deep water is the remains of a hole made by dredging during the reclaiming of the land in that vicinity, and it is probable that, owing to natural causes, it will, in a short time, be filled up, as has happened to the flat around the edges. As the water area available for laying up boats is so small, I do not believe its filling up will have any appreciable effect upon navigation interests, or upon the rights of small vessels desiring to lay up in "The Hague."

The land on both sides of the area to be filled in is owned by the company that desires to do the filling. Under these circumstances, no riparian rights seem to be injured by the proposed fill.

The only opposition to this proposed change, which has manifested itself, has come from the owners of the land farther down on the right bank of Smiths Creek, where there are located some marine railways and lumber yards. But it appears to me that they are so far removed from the immediate locality that their interests will not be, in reality, appreciably affected by this change in the harbor line. The principal reason given for their opposition to this change, in their communications, is that "The Hague" is used for an anchoring ground for yachts, etc. This is undoubtedly true of the lower part of "The Hague," but on account of the narrow and contracted area at the head of it I do not believe that any vessels are likely to lie there, and the weight of the evidence would seem to show that they have seldom, if ever, anchored above Fairfax avenue.

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[a] Not printed.

In compliance with section 11 of the river and harbor act of March 3, 1899, I have caused to be ascertained the tidal volume within the proposed new harbor line, lying between high and low water, and I find this amount to be about 90,000 cubic feet. This is so small, compared with the total tidal flow of Smiths Creek, that I do not believe its subtraction would have appreciable effect upon the scouring effect of the current of the creek.

For the reasons above stated, I respectfully recommend that the harbor line be altered as requested, and that the request of the company to build the bulkhead across "The Hague" be granted, but as other bulkheads built by this company do not appear to be sufficiently strong to stand the pressure behind them, and have bulged in places, and in others have allowed the earth deposited behind them to find its way into the creek, I respectfully recommend that the request to build a bulkhead be based upon the condition that before beginning the work they submit the plans and specifications for the approval of the Department.

Respectfully submitted.

E. Eveleth Winslow,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

APPENDIX M.

IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN NORTH CAROLINA.

REPORT OF CAPT. R. P. JOHNSTON, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Scuppernong River, North Carolina.
2. Ocracoke Inlet, North Carolina.
3. Fishing Creek, North Carolina.
4. Pamlico and Tar rivers, North Carolina.
5. Contentnia Creek, North Carolina.
6. Neuse and Trent rivers, North Carolina.
7. Inland Waterway, between Newbern and Beaufort, North Carolina.
8. Harbor at Beaufort, North Carolina.
9. Inland Waterway, between Beaufort Harbor and New River, North Carolina.
10. New River, North Carolina.
11. Northeast (Cape Fear) and Black rivers, and Cape Fear River above Wilmington, North Carolina.
12. Cape Fear River, North Carolina, at and below Wilmington.
13. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS AND SURVEYS.

14. Carrot Island Slough and Lewis Thoroughfare, North Carolina.
15. Indian Island Slough, North Carolina.
16. Livingston Creek, North Carolina.
17. Lockwood Folly River, North Carolina.
18. Neuse River, North Carolina.
19. New River, North Carolina.

War Department,
United States Engineer Office,
Wilmington, N. C., July 20, 1904.

General: I have the honor to transmit herewith my annual report for the fiscal year ending June 30, 1904, on the river and harbor works in the Wilmington, N. C., district. * * *

Very respectfully,

R. P. Johnston,
Captain, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

M 1.

IMPROVEMENT OF SCUPPERNONG RIVER, NORTH CAROLINA.

References.—See page 228 of current summary.

No active operations of improvement were carried on during the year. The expenditures of the year were, for construction of new plant, $1,408.29; repairs to old plant, $111.90; towing and fuel, $210; rents, $60; superintendence, $119.29, and outstanding indebtedness of last year, $1,065.66; total, $2,975.14.

Up to June 30, 1904, about 60 per cent of the approved project of 1902 had been accomplished.

For present condition of the stream see page 1, current summary report.

The available balance, $32.96, will be applied to maintenance of plant, etc.

Additional appropriations of $4,000 to complete the dredging project, by widening it to the project width of 150 feet, and $2,000 annually for maintenance, are recommended.

Money statement.

July 1, 1903, balance unexpended		$3,008.10
June 30, 1904, amount expended during fiscal year, for works of improvement		2,975.14
July 1, 1904, balance unexpended		32.96
Amount (estimated) required for completion of existing project		4,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$4,000.00	
For maintenance of improvement	2,000.00	
		6,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

ABSTRACT OF APPROPRIATIONS.

Prior to 1887	$10,000
June 13, 1902	10,000
Total appropriated	20,000

COMMERCIAL STATISTICS OF SCUPPERNONG RIVER, NORTH CAROLINA, DURING THE CALENDAR YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cotton	419	Timber	14,000
Cotton seed	395	Lumber	16,796
Fish	221	Shingles	7,000
Potatoes	1,727	Fertilizers	1,912
Vegetables	34	General merchandise	3,227
Cattle	49	Peanuts	163
Hogs	117		
Poultry	40	Total	46,213
Eggs	113		

Gain over last year of 11,907 tons. Number of passengers, 2,796.

Statement of vessels navigating Scuppernong River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	15	1,083	4 to 8
Barges	3	589	7

M 2.

IMPROVEMENT OF OCRACOKE INLET, NORTH CAROLINA.

References.—See page 229 of current summary.

Projected work was completed in 1896.

No work of improvement has been done during the year.

The expenditures of the year were for the outstanding indebtedness of the last year.

It is proposed to reserve the available balance for examinations, to be made from time to time, in order to keep a complete record of the natural changes for use whenever the improvement is resumed. Such an examination will probably be made during the ensuing year.

No recommendation for further appropriation is made.

Money statement.

July 1, 1903, balance unexpended	$8,473.68
June 30, 1904, amount expended during fiscal year for maintenance of improvement	473.68
July 1, 1904, balance unexpended	8,000.00

APPROPRIATIONS.

March 20, 1826, to March 3, 1837	$133,750.00
September 19, 1890	90,000.00
July 13, 1892	15,000.00
	238,750.00
Less amount carried to surplus fund	17.60
	238,732.40
Sales	.15
	238,732.55

M 3.

IMPROVEMENT OF FISHING CREEK, NORTH CAROLINA.

References.—See page 230 of current summary.

Work of improvement completed.

No work was done on this stream during the year because of the long-continued low water which prevailed and, further, because of lack of plant when the stage of water was such as to permit snagging, the plant owned by the combined improvements in this subdistrict being required and in use on other streams considered of more commercial importance.

The expenditures of the year were $46.54, made for the purpose of collecting statistics.

The proposed application of the available balance is to maintain the natural channel as far up as Beech Swamp, and additional appropriations of $500 annually are recommended for this purpose.

Money statement.

July 1, 1903, balance unexpended	$546.28
Amount of deposit December 5, 1899, by Capt. W. E. Craighill, taken up during fiscal year	.40
	546.68
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	46.54
July 1, 1904, balance unexpended	500.14
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

September 19, 1890	$10,000
July 13, 1892	5,000
March 3, 1899	7,750
June 13, 1902	2,000
Total	24,750

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cotton	15.0	Fertilizers	315.0
Cotton seed	575.0	Peanuts	103.5
Cotton-seed oil	155.0		
Hay	5.0	Total	4,668.5
Timber	3,500.0		

Gain over last year, 293.5 tons.

Statement of vessels navigating Fishing Creek, North Carolina, during the calendar year ending December 31, 1903.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
Steamers	2	56	1¼ feet.

M 4.

IMPROVEMENT OF PAMLICO AND TAR RIVER, NORTH CAROLINA.

[One river called Pamlico below and Tar above Washington, N. C.]

References.—See page 231 of current summary.

The project for work below Washington is about 44 per cent completed; that for work above Washington (to Little Falls, near Rockymount) has been completed, but has deteriorated for lack of maintenance.

The disbursements for the year were $21,628.51, of which $598.33 was for outstanding liabilities of last year, leaving $21,030.18 pertaining to the present fiscal year. If to this the present outstanding liabilities, $1,653.84, be added, we obtain $22,684.04 as the cost of the work performed during the year.

This sum is made up as follows:

For construction of new plant	$9,155.68
For snagging by U. S. hoister *Trent*	1,876.92
For dredging by U. S. dredge *Albemarle*	5,846.40
For dredging by U. S. dredge *Scuppernong*	5,805.04

The *Trent* removed from the channel below Washington 1 large snag, 47 stumps, and 7 logs, and from the channel above Washington 5 logs, 14 large snags, 25 stumps, and 7 trees, and cut and hauled back from the bank 7 trees, and trimmed 3 trees.

The *Albemarle* removed 21,133 cubic yards of material and 17 logs, at a cost of 27½ cents, minus, for excavation, and $1.35 each for logs.

The *Scuppernong* removed 40,915 cubic yards of material, 63 logs, and 411 stumps, at a cost of 11½ cents, minus, per cubic yard for excavation, $1.35 each for logs, and $2.86 each for stumps.

The relative cost of dredging, removing logs, and removing stumps can not be obtained absolutely, but the above are the approximate costs of each.

The work of the two dredges was from a cut 66⅔ feet wide, 362 feet long immediately below wagon bridge at Washington, and from cuts below Washington, 75 feet wide and 300 feet long, 100 feet wide and 3,600 feet long, and 66⅔ feet wide and 2,600 feet long.

All dredging was to a depth of 9 feet mean low water.

The proposed application of the available balance is to complete the channel below Washington to the project depth and to maintain the natural channel above Washington.

Additional appropriations of $6,000 annually are recommended for the purpose of maintenance.

Money statement.

July 1, 1903, balance unexpended		$30,687.46
June 30, 1904, amount expended during fiscal year:		
For works of improvement	9,911.64	
For maintenance of improvement	1,716,87	
		21,628.51
July 1, 1904, balance unexpended		9,058.95
July 1, 1904, outstanding liabilities		1,653.84
July 1, 1904, balance available		7,405.11
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement in addition to the balance unexpended July 1, 1904		6,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838.	$10,000.00	$10,000.00	August 11, 1888	$10,000.00	$68,000.00
			September 19, 1890	10,000.00	78,000.00
August 14, 1876	15,000.00	15,000.00	July 13, 1892	10,000.00	88,000.00
May 3, 1879	6,000.00	21,000.00	August 18, 1894	10,000.00	98,000.00
June 14, 1880	9,000.00	30,000.00	June 3, 1896	5,000.00	103,000.00
March 3, 1881	8,000.00	38,000.00	March 3, 1899	15,000.00	118,000.00
August 2, 1882	10,000.00	48,000.00	June 13, 1902	35,500.00	153,500.00
July 5, 1884	5,000.00	53,000.00	Sales	49.55	153,549.55
August 5, 1886	5,000.00	58,000.00			

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Seed cotton	889	Wood	11,080
Cotton	11,514	Timber	309,680
Cotton seed	10,260	Lumber	269,462
Cotton-seed oil	1,455	Shingles	8,049
Cotton-seed meal	2,800	Fertilizers	18,346
Tobacco, leaf	178	Machinery	565
Rice, rough	105	General merchandise	52,222
Grains	764	Rafting gear	250
Hay	2,465	Coal and minerals	2,705
Potatoes	3,887	Tar	32
Vegetables	330	Peanuts	598½
Cattle	81	Oysters, canned	19
Horses	135	Truck barrels	511
Hogs	9	Shells, oyster	2,000
Poultry	29½	Tiling	156
Eggs	184	Clams	9
Fish	652		
Oysters	439	Total	845,377
Brick	133,525		

Gain over last year, 13,361½ tons. Number of passengers, 17,911.
One transportation line established during year.

Statement of vessels navigating Pamlico and Tar River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	49	784	2½ to 9
Sloops and schooners	50	1,200	2 to 8
Barges	50	13,750	5 to 9
Naphtha launches	10	100	2 to 5

M 5.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

References.—See page 232 of current summary.

The work of improvement completed.

The work of the last year has been exclusively that of maintenance of the portion of the stream between its mouth and Snowhill by the removal of only such obstructions as were absolutely necessary to prevent the suspension of navigation. Between March 9 and 18 the U. S. hoister *Trent*, operated by hired labor, removed 4 large snags, 2 stumps, 1 log, and 35 trees from the stream, and 1 tree and 2½ cords of brush from the banks, at a total cost of $184.32.

It is proposed to reserve the small available balance for maintenance of plant.

Additional appropriations of $2,000 annually for maintenance are recommended.

Money statement.

July 1, 1903, balance unexpended	$286.55
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	184.32
July 1, 1904, balance unexpended	102.23
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	2,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1881	$10,000	$10,000	July 13, 1892	$7,000	$59,000
August 2, 1882	10,000	20,000	August 18, 1894	10,000	69,000
July 5, 1884	5,000	25,000	March 3, 1899	2,000	71,000
August 5, 1886	15,000	40,000	Allotted from emergency appropriation	500	71,500
August 11, 1888	5,000	45,000			
September 19, 1890	7,000	52,000			

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cotton	612	Vegetables	66
Cotton seed	160	General merchandise	780
Hay	21	Machinery	5
Timber	7,500		
Fertilizers	4,700	Total	13,842
Grain	4		

Gain over 1902, 3,450 tons.

Statement of vessels navigating Contentnia Creek, North Carolina, during the calendar year ending December 31, 1903.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	4	223	2 to 4

M 6.

IMPROVEMENT OF NEUSE AND TRENT RIVERS, NORTH CAROLINA.

(A) NEUSE RIVER.

References.—See page 233 of current summary.

The disbursements for the year were $6,716.02, of which $119.84 was for outstanding liabilities of last year, leaving $6,596.18 pertaining to the present fiscal year. If to this the present outstanding liabilities, $3.04, be added, we obtain $6,599.22 as the cost of the work performed during the year. This sum is made up as follows:

For minor surveys	$85.55
For survey from Goldsboro to Newbern	497.68
For snagging	672.39
For dredging	5,343.60

The U. S. snagboat *Trent* removed 189 logs, 609 stumps, and 1 large snag, and the U. S. dredge *Albemarle* removed 36,059 cubic yards of material, at a cost of 9.65 cents per cubic yard, scow measurement; 151 logs at $1.35 each, and 581 stumps at $2.86 each.

The dredging was done at Newbern and resulted in a channel of 8 feet depth at dead low water, 200 feet wide for the first 1,500 feet below the wagon bridge; 100 feet wide for 340 feet farther, and 66⅔ feet wide for a still farther distance of 1,950 feet.

A survey from Newbern to Goldsboro was made during the year.

It is proposed to expend the available balance in the restoration, by dredging, of the channels at and near Newbern.

The additional appropriations recommended, based on the existing project, are as follows: Above Newbern, for improvement by constructing additional jetties or training dikes, dredging, snagging, protecting banks, etc., $40,000; for maintenance, $6,500; at and below Newbern for improvement by dredging, $14,100; for maintenance, $1,500.

The project is 25 per cent completed.

It is thought that much better results could be derived with a given expenditure by appropriations sufficiently large to permit vigorous and persistent work, based on a well-defined plan, than by small appropriations which make it necessary to confine efforts to the most imperative requirements only.

The above recommendation is, as stated, based on the existing project. If the project be modified as a result of the report on survey published in House Document No. 648, Fifty-eighth Congress, second session, the recommendation would be modified accordingly.

Money statement.

July 1, 1903, balance unexpended		$6,833.60
Amount allotted from appropriation for emergencies in river and harbor works, act of June 13, 1902, during fiscal year		2,000.00
		8,833.60
June 30, 1904, amount expended during fiscal year, for works of improvement		6,716.02
July 1, 1904, balance unexpended		2,117.58
July 1, 1904, outstanding liabilities		3.04
July 1, 1904, balance available		2,114.54
Amount (estimated) required for completion of existing project		91,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$54,100.00	
For maintenance of improvement	8,000.00	
		62,100.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

Date.	Amount.	Aggregate.
June 18, 1878	$40,000.00	$40,000.00
March 3, 1879	45,000.00	85,000.00
June 14, 1880	45,000.00	130,000.00
March 3, 1881	30,000.00	160,000.00
August 2, 1882	30,000.00	190,000.00
July 5, 1884	20,000.00	210,000.00
August 5, 1886	22,500.00	232,500.00
August 11, 1888	15,000.00	247,500.00
September 30, 1890	20,000.00	267,500.00
July 13, 1892	15,000.00	282,500.00
August 18, 1894	$7,000.00	$289,500.00
June 3, 1896	7,000.00	296,500.00
March 3, 1899	10,000.00	306,500.00
June 13, 1902	[a]13,500.00	320,000.00
Allotted from appropriations for emergencies in river and harbor works, act June 13, 1902.	2,000.00	322,000.00
Sales	48.90	322,048.90

[a] Allotted from appropriation of $20,000 for Neuse and Trent rivers, North Carolina.

COMMERCIAL STATISTICS FOR YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.
	Tons.
Cotton	7,943
Cotton seed	4,694
Cotton-seed oil	15
Cotton-seed meal	1,518
Tobacco, leaf	2,418
Rice, rough	340
Grains	8,269
Hay	3,103
Potatoes	4,499
Vegetables	3,524
Cattle	6
Horses	103
Hogs	25
Poultry	30
Eggs	115
Fish	1,465
Oysters	1,849
Clams	2,487
Rosin	1,660
Turpentine, crude	44
Turpentine, spirits	540
Wood	5,260
Timber	147,250
Lumber	214,200
Shingles	5,279
Fertilizers	32,815
Machinery	3,538
General merchandise	30,100
Coal and minerals	2,775
Peanuts	5
Fish oil	683
Total	486,561

Gain over last year, 29,567 tons. Transportation lines established during the year, 2. Number of passengers, 16,245.

Statement of vessels navigating the Neuse River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	32	2,266	2 to 8
Schooners, sloops, etc	150	6,686	2 to 8
Barges	38	11,372	6 to 8

(B) TRENT RIVER.

References.—See page 234 of current summary.

The work of the year consisted of dredging at Newbern, where the Trent River empties into the Neuse, and of maintaining (by means of snagging, etc.) the channel between Newbern and the head of navigation at Trenton, a distance of $38\frac{1}{6}$ miles.

Between October, 1903, and February, 1904, the U. S. hoister *Trent*, operated by hired labor, removed from this channel 39 large snags, 57 stumps, 385 logs, and 21 trees; and on the banks 72 trees were cut and hauled back, 16 trees trimmed, and 11 cords of brush cut, at a total cost of $1,345.20.

Dredging at Newbern was begun on December 10, 1903, and suspended on the 17th of the same month. The dredge was then removed to another river where her services were more urgently needed. During the seven days she was engaged in dredging at Newbern the U. S. dredge *Albemarle*, operated by hired labor, removed from a cut 570 feet long, 33⅓ feet wide and 8 feet deep at dead low water, 2,486 cubic yards of material and 3 stumps, at a total cost of $1,094.43, or about 43½ cents per cubic yard. This price is abnormally large on account of the necessity of removing the plant to another stream before she had gotten well started on the work in hand. The cost per cubic yard would have decreased rapidly as the quantity increased.

In addition to this the sum of $558.41 was expended in repair of plant. This stream's pro rata expenditures for a new dredge (*Scuppernong*) which was built for work on this and other streams, amounted to $1,281.12; and for the new scows $843.29. Total expenditures for the year, $5,122.45.

The project for improvement is about 2½ per cent completed.

With the available balance it is proposed to maintain the present channel as far as Goldsboro and to dredge as much as possible of the channel at and below Newbern, in accordance with the project submitted in the report on examinations and surveys, published in the Annual Report for 1897, page 1427.

Additional appropriations are recommended of $19,000 for completing the dredging project; $1,000 for restoration of Turning basin at Trenton, and $2,500 for annual maintenance of channel to Trenton.

Money statement.

July 1, 1903, balance unexpended		$5,337.95
Amount allotted during fiscal year from appropriation for emergencies in river and harbor works, act June 13, 1902		1,000.00
		6,337.95
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$3,779.90	
For maintenance of improvement	1,342.55	
		5,122.45
July 1, 1904, balance unexpended		1,215.50
Amount (estimated) required for completion of existing project		19,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$19,000.00	
For maintenance of improvement	[a]3,500.00	
		22,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1879	$7,000.00	$7,000.00	August 18, 1894	$4,000.00	$64,500.00
June 14, 1880	10,000.00	17,000.00	June 3, 1896	2,000.00	66,500.00
March 3, 1881	5,000.00	22,000.00	March 3, 1899	2,500.00	69,000.00
August 2, 1882	10,000.00	32,000.00	June 13, 1902	[b]6,500.00	75,500.00
July 5, 1884	10,000.00	42,000.00	Allotted from appropriation for emergencies in river and harbor works, act June 13, 1902	1,000.00	76,000.00
August 5, 1886	3,500.00	45,500.00	Sales	48.90	76,548.90
August 11, 1888	5,000.00	50,500.00			
September 19, 1890	5,000.00	55,500.00			
July 13, 1892	5,000.00	60,500.00			

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[a] Includes $1,000 for restoration of turning basin.

[b] Allotted from $20,000 appropriated for Neuse and Trent rivers, North Carolina.

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	7,350	Rosin	732
Cotton seed	2,177	Turpentine, crude	7
Cotton-seed meal	1,263	Turpentine, spirits	40
Tobacco, leaf	2,432	Wood	1,590
Rice, rough	340	Timber	86,750
Grains	8,469	Lumber	86,000
Hay	3,015	Shingles	220
Potatoes	2,486	Fertilizers	8,006
Vegetables	2,538	Machinery	3,598
Cattle	29	General merchandise	26,535
Horses	100	Coal and minerals	1,740
Hogs	8	Peanuts	40
Poultry	29	Tar	8
Eggs	124	Fish oil	147
Fish	1,206	Rafting gear	250
Oysters	1,324		
Cotton-seed oil	15	Total	251,055
Clams	2,487		

Gain over last year, 49,351 tons. Number of passengers, 16,785.

Statement of vessels navigating the Trent River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	32	2,266	2 to 8
Schooners, sloops, etc	100	4,443	2 to 8
Barges	38	11,372	6 to 8

M 7.

IMPROVEMENT OF WATERWAY BETWEEN NEWBERN AND BEAUFORT, NORTH CAROLINA.

References.—See page 235 of current summary.

This work has been 30 per cent completed, but owing to several years' suspension of operations has deteriorated so that it is only about 20 per cent completed.

No work of improvement was done during the year.

The work on this waterway has been suspended for several years pending the cession or sale to the Government of the private canal included therein.

The survey of June, 1901, indicated a number of shoals and the necessity for considerable work, in order to obtain project depth and width, which work would be useless unless the canal company made a corresponding increase in the canal itself.

Recent reports indicate, however, that there is considerably less depth now in the approaches to the canal than in the canal itself; hence, the application of the present available balance of $6,300 to clearing out and deepening the approaches is recommended.

No further appropriation is recommended at present.

Money statement.

July 1, 1903, balance unexpended	$6,300.00
July 1, 1904, balance unexpended	6,300.00

APPROPRIATED.

Date.	Amount.	Aggregate.
August 2, 1882	$10,000	$10,000
August 5, 1886	10,000	20,000
August 11, 1888	15,000	35,000

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	299	Turpentine, crude	37
Cotton seed	627	Turpentine, spirits	500
Cotton-seed meal	55	Wood	2,500
Grains	10	Timber	39,375
Hay	235	Lumber	37,210
Potatoes	52	Shingles	59
Vegetables	50	Fertilizers	3,637
Hogs	25	General merchandise	3,412
Poultry	6	Peanuts	5
Eggs	8	Fish oil	536
Fish	85		
Rosin	928	Total	89,651

Gain over last year 22,677 tons. One transportation line was established during the year.

Statement of vessels navigating the waterway between Newbern and Beaufort, N. C., during the calendar year ending December 31, 1903.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Naphtha launches	10	30	2 to 4
Steamers	6	229	3 to 7
Schooners, sloops, etc	40	480	2 to 4
Barges	16	4,000	5 to 7

M 8.

IMPROVEMENT OF HARBOR AT BEAUFORT, NORTH CAROLINA.

References.—See page 236, current summary.

The expenditures of the year were $1,454.84, and the work was as follows:

At Fort Macon 532 linear feet of sand fences were built new, 8,448 feet were built higher, 1,966 feet were repaired, 17,738 feet were filled under, and 816 feet were banked with sand, and between the high and low water lines 132 linear feet of low groynes were built.

At Shackelford Point 6,804 feet were built higher, 368 feet repaired, and 11,083 feet filled under, and 896 feet of fence banked with sand.

Bermuda grass was planted at both places to hold the sand accumulated by the fences and to prevent its drifting away.

It is proposed to apply the available balance to maintaining the sand fences at Fort Macon and Shackelford Point and to restoring the project depth across Bulkhead Shoal.

An additional appropriation of $3,000 annually is recommended for the maintenance of this improvement.

Money statement.

July 1, 1903, balance unexpended	$2,224.57
Amount of deposit of September 19, 1896, by Maj. W. S. Stanton, taken up during fiscal year	2.32
	2,226.89
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1,454.84
July 1, 1904, balance unexpended	772.05
July 1, 1904, outstanding liabilities	141.02
July 1, 1904, balance available	631.03
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	3,000.00

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836	$5,000	$5,000	August 11, 1888	$35,000	$125,000
			September 19, 1890	15,000	140,000
March 3, 1880	30,000	30,000	July 13, 1892	10,000	150,000
August 2, 1882	25,000	55,000	June 3, 1896	5,000	155,000
July 5, 1884	20,000	75,000	June 13, 1902	3,000	158,000
August 5, 1886	15,000	90,000	Sales	350	158,350

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Hay	185	Poultry	9
Vegetables	5	Shingles	50
Cotton	152	Lumber	6,850
Cotton seed	502	Fertilizers	3,359
Cotton seed meal	55	General merchandise	17,392
Grain	25	Tar	14
Eggs	13	Fish oil	579
Fish	7,450	Peanuts	5
Oysters	7,600	Soft crabs	531
Clams	1,400	Resin	928
Wood	5,900	Turpentine	287
Horses	5		
Hogs	2	Total	60,800
Cross-ties	7,500		

Loss since last year, 18,183 tons. Transportation lines established during the year, 1. Number of passengers, 1,500.

Statement of vessels navigating the harbor at Beaufort, N. C., for the calendar year ending December 31, 1903.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	15	600	3 to 7½
Schooners, sloops, etc	315	4,000	2½ to 12
Naphtha launches	40	400	2½ to 4

M 9.

IMPROVEMENT OF WATERWAY BETWEEN BEAUFORT HARBOR AND NEW RIVER, NORTH CAROLINA.

References.—See page 237 of current summary.

The project is about 75 per cent completed.

The expenditures of the year were $3,554.56, which included $119.96 outstanding indebtedness of last year, and $3,434.60 expenses of the present year, for surveys, construction of plant, repair of old plant, fuel, and towing plant to site of work, operating same, and superintendence, resulting in the removal, since the beginning of work, April 21, 1904, to end of fiscal year of 6,939.6 cubic yards of material from a cutting 200 feet long, 30 feet wide, and 3 feet deep at mean low water across the shoal between Shell Point and Broad Creek, at a cost of 49 cents per cubic yard.

It is proposed to apply the available balance to the completion of the Bogue Sound channel to project depth and width.

After completion of this project additional appropriations of about $2,000 annually will be needed to maintain the channel.

Money statement.

July 1, 1903, balance unexpended	$10,329.68
June 30, 1904, amount expended during fiscal year, for works of improvement	3,554.56
July 1, 1904, balance unexpended	6,775.12
July 1, 1904, outstanding liabilities	831.18
July 1, 1904, balance available	5,943.94
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	2,000.00

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
August 5, 1886	$10,000	$10,000	August 18, 1894	$2,500	$42,500
August 11, 1888	5,000	15,000	June 3, 1896	1,000	43,500
September 19, 1890	15,000	30,000	June 13, 1902	9,500	53,000
July 13, 1892	10,000	40,000			

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cattle	20	Horses	5
Hay	225	Clams	2,530
Cotton	152	Turpentine, crude	37
Cotton seed	502	Turpentine, spirits	250
Grains	125	Wood	2,700
Potatoes	2	Shingles	57
Vegetables	55	Lumber	12,390
Hogs	29	Fertilizers	1,354
Poultry	9	General merchandise	1,167
Eggs	13	Machinery	100
Fish	3,762	Coal and minerals	30
Oysters	1,868	Fish oil	143
Cotton-seed meal	75	Soft crabs	38
Peanuts	12	Cross-ties	7,500
Tar	14		
Rosin	928	Total	36,092

Gain over last year, 17,484.2 tons.

One transportation line was established during the year. Number of passengers, 1,000.

Statement of vessels navigating the inland waterway between Beaufort Harbor and New River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	1	52	3
Schooners, sloops, etc	50	500	2 to 4
Naphtha launches	30	300	2½ to 4

M 10.

IMPROVEMENT OF NEW RIVER, NORTH CAROLINA.

References.—See page 238 of current summary.

Project was completed in 1894.

Work of the year has been only the collection of commercial statistics. The expenditures of the year were $1.80 for office supplies.

It is proposed to withhold the available balance from expenditure pending action on the report of the examination and survey of last year (H. Doc. No. 239, 58th Cong., 2d sess.)

No further appropriation is asked for.

Money statement.

July 1, 1903, balance unexpended	$3,233.29
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1.80
July 1, 1904, balance unexpended	3,231.49
July 1, 1904, outstanding liabilities	12.97
July 1, 1904, balance available	3,218 52

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838		$50,000.00	August 11, 1888	$3,000.00	$23,000.00
			September 19, 1890	5,000.00	28,000.00
August 2, 1882	$5,000.00	5,000.00	July 13, 1892	5,000.00	33.000.00
July 4, 1884	5,000.00	10,000.00	Sales	.10	33,000.10
August 5, 1886	10,000.00	20,000.00			

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cotton	100	Timber	1,000
Cotton seed	200	Lumber	700
Fish	1,200	Fertilizers	600
Oysters	500	Grain	5
Clams	150	General merchandise	1,000
Rosin	200	Peanuts	20
Poultry	1		
Eggs	1	Total	6,177
Wood	500		

Gain over last year, 966 tons. Number of passengers, 500.

Statement of vessels navigating New River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Schooners	3	40	2.5 to 5
Sharpies	15	50	1 to 2
Launches	8	25	2 to 3

M 11.

IMPROVEMENT OF NORTHEAST AND BLACK RIVERS AND CAPE FEAR RIVER ABOVE WILMINGTON, NORTH CAROLINA.

(A) NORTHEAST RIVER.

References.—See page 239 of current summary.

Work on project 60 per cent completed.

Work done during the year has consisted of maintenance by snagging, using Government plant and hired labor, caring for plant, and collecting commercial statistics.

Active operations were carried on during the month of September. The worst obstructions between Wilmington and the seventy-first mile-board were removed, and the river thoroughly snagged and the banks trimmed between the sixty-sixth and seventy-first mile boards. No work was done above Hallsville. There were removed from the channel 356 large snags, 8 stumps, 1 log, and the wreck of an old scow, and on the bank 126 trees were hauled back, at a total cost of $634.51. The plant was detained on the work by low water from September 16 to October 23. Work was suspended in October and the small balance reserved for care of plant.

With the available balance it is proposed to maintain the natural channel up to Hallsville.

Additional appropriations of $3,000 annually are recommended for the maintenance of the natural channel.

Money statement.

July 1, 1903, balance unexpended	$948.95
Amount allotted from appropriation for emergencies in river and harbor works, act June 13, 1902	500.00
	1,448.95
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	634.51
July 1, 1904, balance unexpended	814.44
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	3,000.00

APPROPRIATIONS.

September 19, 1890, for North East (Cape Fear) River, North Carolina	$5,000.00
July 13, 1892, for North East (Cape Fear) River, North Carolina	5,000.00
August 18, 1894, for North East (Cape Fear) River, North Carolina	5,000.00
March 3, 1899, for North East River, North Carolina	2,000.00
June 13, 1902, for North East River, North Carolina	[a] 2,000.00
Other receipts, March 4, 1897, sales to Cape Fear River	243.33
Allotted from emergency appropriation June 13, 1902	500.00
Total	19,743.33

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1903.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cotton	375	Turpentine, crude	171
Cotton seed	143	Turpentine, spirits	257
Cotton-seed meal	62	Tar	560
Cotton-seed oil	4	Wood	5,500
Rice, rough	10	Timber	64,464
Grain	120	Lumber	40
Hay and rice straw	35	Shingles	781
Potatoes	51	Poles and piles	900
Peanuts	45	Cross-ties	5,250
Fruit and vegetables	2	Brick	6,250
Cattle	27	Fertilizer	11,427
Hogs	20	General merchandise	4,200
Eggs	7	Lime	25
Poultry	15		
Fish	2	Total	102,183
Rosin	1,440		

Increase since last year, 1,997 tons.
Number of passengers, 550.

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[a] Allotted from joint appropriation of $10,000 for North East and Black rivers, North Carolina, and Cape Fear River, North Carolina, above Wilmington.

Statement of vessels navigating North East River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	1	31	3.5
Steam tugs	10	172	2.5 to 7.5
Flats (about)	45	3,375	1.5 to 4

(B) BLACK RIVER.

References.—See page 240 of current summary.

Work on project completed.

Work done during the year has consisted of maintenance by snagging, using Government plant and hired labor, putting up mile boards, caring for plant, and collecting commercial statistics.

Active operations were carried on during the month of August. Mile boards were put up between Clear Run and the mouth, and the worst obstructions were removed from the channel between the same points. There were removed 249 large snags and 12 logs at a total cost of $402.72. Work was suspended in August, and the small balance available reserved for care of plant.

With the available balance it is proposed to maintain the natural channel as far up as Clear Run.

Additional appropriations of $3,000 annually are recommended for the maintenance of this stream.

Money statement.

July 1, 1903, balance unexpended	$952.96
Amount allotted from appropriation for emergencies in river and harbor works, act June 13, 1902	500.00
	1,452.96
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	402.72
July 1, 1904, balance unexpended	1,050.24

Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	3,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
August 5, 1886	$3,000.00	$3,000.00	June 13, 1902	[a]$2,000.00	$20,000.00
July 13, 1892	10,000.00	13,000.00	Other receipts: Sales, etc.	243.34	20,243.34
August 17, 1894	2,000.00	15,000.00	Allotted from emergency appropriation June 13, 1902	500.00	20,743.34
June 3, 1896	1,000.00	16,000.00			
March 3, 1899	2,000.00	18,000.00			

[a] Allotted from joint appropriation of $10,000 for North East and Black rivers, North Carolina, and Cape Fear River, North Carolina, above Wilmington.

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cotton	250	Tar	1,078
Cotton seed	106	Wood	6,000
Cotton-seed meal	107	Timber	41,991
Grains	125	Lumber	100
Hay and straw	100	Shingles	1,625
Potatoes	50	Poles, telegraph	750
Cattle	40	Cross-ties	6,250
Hogs	15	General merchandise	10,180
Poultry	30	Machinery	25
Eggs	10	Peanuts	15
Fertilizer	1,270	Fish	3
Rosin	3,570	Brick	15
Turpentine—			
Crude	150	Total	74,123
Spirits	338		

Increase since last year 1,899 tons.

All of the above passed over 12 miles of Cape Fear River, North Carolina, above Wilmington, but is not included in the report for that river.

Statement of vessels navigating Black River, North Carolina, during the calendar year ending December 31, 1903.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	4	95	3 to 3.5
Steam tugs	5	49	3.5 to 4.5
Flats (about)	40	3,000	1.5 to 4.5

(C) CAPE FEAR RIVER ABOVE WILMINGTON.

References.—See page 240 of current summary.

The project of 1881 has been about 30 per cent completed, and no work under it, except for maintenance, has been done for several years. It has been superseded by the canalization project of 1902.

The work of the year for maintenance has been the removal of 1,345 large snags, 248 stumps, and 26 logs from the channel between Fayetteville and the mouth of Black River, for the expenditures shown in accompanying money statement.

The work of the year under the canalization project has been as follows: Six hundred and sixty-four cross sections were taken, 309,735 linear feet traverse line run, 300,775 linear feet river line run, 305,500 linear feet level line run, 309,000 linear feet channel soundings taken, and 637 cross sections sounded, for the expenditures shown as stated, completing the survey for about 58 miles.

With the available balance it is proposed to maintain the natural channel up to Fayettevile, to continue the survey for determining lock and dam sites under the canalization project for obtaining 8 feet depth to Fayetteville, and to purchase sites for locks and dams when locations are determined.

Additional appropriations are recommended of $8,000 annually for the maintenance of the present channel to Fayetteville, and of $400,000 for the construction of the first lock and dam. It is not believed advisable to begin the construction of a lock and dam until funds are available for its completion under one contract.

Money statements.

MAINTENANCE.

July 1, 1903, balance unexpended	$2,945.62
Amount of deposit of June 30, 1896, by Capt. W. H. Bixby, taken up during fiscal year	3.00
	2,948.62
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1,598.50
July 1, 1904, balance unexpended	1,350.12
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	8,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

CANALIZATION.

July 1, 1903, balance unexpended	$49,647.77
June 30, 1904, amount expended during fiscal year, for works of improvement	5,344.25
July 1, 1904, balance unexpended	44,303.52
July 1, 1904, outstanding liabilities	818.14
July 1, 1904, balance available	43,485.38
Amount (estimated) required for completion of existing project	1,300,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	400,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897.

APPROPRIATIONS

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 3, 1881	$30,000.00	$30,000.00	August 18, 1894	$14,000.00	$132,250.00
August 2, 1882	30,000.00	60,000.00	June 3, 1896	5,000.00	137,250.00
July 5, 1884	5,000.00	65,000.00	March 3, 1899	5,000.00	142,250.00
August 5, 1886	11,250.00	76,250.00	June 13, 1902[a]	56,000.00	198,250.00
August 11, 1888	12,000.00	88,250.00	Other receipts: Sales to other appropriations during 1897	414.33	198,664.33
September 19, 1890	15,000.00	103,250.00			
July 13, 1892	15,000.00	118,250.00			

[a] Six thousand dollars allotted from joint appropriation of $10,000 for North East and Black rivers, North Carolina, and Cape Fear River, North Carolina, above Wilmington.

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1902.

Class of goods.	Quantity.	Class of goods.	Quantity.
	Tons.		*Tons.*
Cotton	1,250	Timber	52,426
Cotton seed	208	Lumber	417
Cotton-seed meal	120	Shingles	1,359
Cotton-seed oil	4	Fertilizers	19,170
Grains	97	Machinery	150
Rice, rough	20	General merchandise	30,385
Straw and hay	30	Coal and minerals	125
Potatoes	22	Brick	6,250
Cattle	77	Peanuts	....
Horses	11	Fish	....
Hogs	14	Fruit and vegetables	19
Poultry	60	Cross-ties	22,519
Eggs	61	Poles and piles	6,080
Rosin	1,751	Tobacco, leaf	3
Turpentine:		Railroad iron	275
Crude	472	Pine, straw	1,000
Spirits	348		
Tar	1,969	Total	156,692
Wood	10,000		

Decrease since last year, 10,842 tons, which is due to decrease in shipments of fertilizer.

Number of passengers, 2,500.

All of Black River commerce passes over 12 miles of this river, but is not included in the above.

Statement of vessels navigating Cape Fear River, North Carolina, above Wilmington, during the year ending December 31, 1903.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	6	439	3 to 4
Steam tugs	7	177	3.5 to 7
Flats (about)	40	3,000	1.5 to 4.5

M 12.

IMPROVEMENT ON CAPE FEAR RIVER, NORTH CAROLINA, AT AND BELOW WILMINGTON.

References.—See page 242 of current summary.

Work on project is about 60 per cent completed.

The operations for the year have been the work of the suction dredge *Cape Fear* on the Ocean bar and Snows Marsh channel and the clamshell dredge *Ajax* on the river channels and on the Old Woodbury jetty, making minor surveys, and repairing New Inlet and Swash Defense dams, and caring for plant. All work was done by hired labor and United States plant.

The disbursements of the year were $68,253.33, of which $5,998.98 was for outstanding liabilities of last year, leaving $62,254.35 pertaining to the present fiscal year. If to this the present outstanding liabilities, $3,453.21, be added, we obtain the sum of $65,707.56.

To arrive at the cost of the year's work, the sum of $7,829.66

(received for rents and sales) is deducted, leaving $57,878.30 the actual cost of the following work:

192,230 cubic yards dredging by dredge *Cape Fear*, at 9.1 cents	$17,524.40
496,820 cubic yards dredging by dredge *Ajax*, at 6.4 cents	31,989.08
1 stump removed by *Ajax*	
6 logs removed by *Ajax*	
1,781 tons of stone removed by dredge *Ajax*, at $2	3,559.34
1,781 tons of stone placed on dams by steamer *Wright*, at 64 cents	1,132.13
Repairs to New Inlet dam	3,673.35
Total	57,878.30

For details of the foregoing work see report of Assistant Engineer Robert C. Merritt appended.

Money statement.

July 1, 1903, balance unexpended		[a] $94,075.00
Amount allotted from appropriation for maintenance of river and harbor improvements, act of April 28, 1904	$30,000.00	
Amount received from sales during fiscal year	4,574.26	
Amount of deposit September 19, 1899, by Maj. W. S. Stanton, taken up during year	16.00	
Amount of deposit December 5, 1899, by Capt. W. E. Craighill, taken up during year	1.20	
		34,591.46
		128,666.46
June 30, 1904, amount expended during fiscal year for maintenance of improvement		68,253.33
July 1, 1904, balance unexpended		60,413.13
July 1, 1904, outstanding liabilities		3,453.21
July 1, 1904, balance available		56,959.92
Amount (estimated) required for completion of existing project		885,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$300,000.00	
For maintenance of improvement	50,000.00	
		350,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
March 2, 1829, to July 22, 1854		[b] $363,228.92	August 11, 1888	$245,000	$2,105,000.00
			September 19, 1890	170,000	2,275,000.00
July 11, 1870	$100,000	100,000.00	July 13, 1892	200,000	2,475,000.00
March 3, 1871	75,000	175,000.00	August 18, 1894	200,000	2,675,000.00
June 10, 1872	100,000	275,000.00	June 3, 1896	195,000	2,870,000.00
March 3, 1873	100,000	375,000.00	March 3, 1899	150,000	3,020,000.00
June 23, 1874	150,000	525,000.00	June 13, 1902	150,000	3,170,000.00
March 3, 1875	150,000	675,000.00	Allotted from maintenance appropriation act, April 28, 1904	30,000	3,200,000.00
August 14, 1876	132,500	807,500.00			
June 18, 1878	160,000	967,500.00			
March 3, 1879	100,000	1,067,500.00	Other receipts: Sales and rents to other appropriations		20,443.19
June 14, 1880	70,000	1,137,500.00			
March 3, 1881	140,000	1,277,500.00			
August 2, 1882	225,000	1,502,500.00			
July 5, 1884	200,000	1,702,500.00			3,220,443.19
August 5, 1886	157,500	1,860,000.00			

[a] Decreased $7.11, sum of Treasury settlements February 10, 1898–December 11, 1899.
[b] Balance of $3,728.07 turned over to surplus fund.

COMMERCIAL STATISTICS FOR YEAR ENDING DECEMBER 31, 1903.

Exports, foreign and coastwise.

[Furnished by the secretary of the Wilmington Chamber of Commerce and Col. J. L. Cantwell.]

	Tons.
Cotton	89, 229
Manufactured cotton and yarn goods	810
Lumber	86, 700
Gum logs	6, 000
Cross-ties	32, 914
Shingles	3, 120
Rosin	15, 904
Tar	4, 783
Turpentine, spirits	3, 458
Pitch	135
Turpentine, crude	261
Peanuts	563
Miscellaneous, estimated	65, 000
Total	308, 877

Exports, internal.

[Furnished by steamboat, flat, and raft men.]

Miscellaneous	75, 588

Total of exports (foreign, coastwise and internal), 384,465 tons.

Imports, foreign and coastwise.

[Furnished by importers and manufacturers.]

	Tons.
Fertilizer	59, 358
Coal	15, 800
Salt	6, 769
Oil	9, 359
Cement	6, 695
Rock, crushed	2, 481
Grain, corn, and rice	1, 000
Miscellaneous (naval stores, cotton, and general merchandise)	100, 000
Total	201, 462

Internal imports.

[Furnished by steamboat, flat and raft men.]

	Tons.
Cotton	1, 875
Tar	3, 607
Turpentine:	
Spirits	943
Crude	793
Rosin	6, 711
Lumber and timber	158, 881
Cross-ties	34, 019
Shingles	3, 765
Telegraph poles and piles	7, 730
Wood	21, 500
Brick	12, 500
Miscellaneous	5, 086
Total	257, 410

Total of imports (foreign, coastwise, and internal), 458, 872 tons.

SUMMARY.

Exports.

	Tons.
Foreign and coastwise	308,877
Internal	75,588

Imports.

Foreign and coastwise	201,462
Internal	257,410
Total commerce	843,337

Increase since last year, 1,706 tons.
Transportation lines established during the year, 1.

Statement of foreign and coastwise vessels of 100 tons and over at the port of Wilmington, N. C., for the calendar year ending December 31, 1903.

[Furnished by Capt. Edgar Williams, harbor master.]

Class of vessel.	American.		Foreign.		Total.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
Steamers	105	136,220	46	83,341	151	219,561
Barks	2	818	12	7,570	14	8,388
Brigs	3	1,009	1	233	4	1,242
Barges	9	26,364	....	....	9	26,364
Schooners	114	51,753	13	22,597	127	54,350
Total	233	216,164	72	93,741	305	309,905

The above does not include vessels which took cargoes to Southport, Fort Caswell, or the fish factories; vessels coming to Southport in distress, for supplies, or for a harbor, the total estimated tonnage of which is 40,000.

Vessels owned by the United States Government are not included. No record is made of steamboats plying on the rivers above and below Wilmington, or of small vessels and steam tugs of less than 100 tons.

Foreign commerce for the calendar year 1903.

[Furnished by the collector of customs of the port of Wilmington, N. C.]

Class of goods.		Quantity.	Value.	
			Exports.	Imports.
Cotton	bales	343,933	$19,399,409	....
Rosin	barrels	86,253	165,841	....
Tar	do	5,001	11,081	....
Pitch	do	37	61	....
Spirits of turpentine	gallons	312	211	....
Lumber	M. feet	7,592	117,914	....
Shingles	M	1,381	8,469	....
Miscellaneous	tons	....	63,538	....
Kainit	do	10,794	....	$50,424
Pyrites	do	7,796	....	15,836
Potash (M. and S. of)	do	1,540	....	53,657
Brimstone	do	....	....	....
Molasses	gallons	....	....	....
Miscellaneous	tons	1,745	....	15,820
Total		....	19,766,524	135,737

Total exports (foreign) for 1903	$19,766,524
Total exports (foreign) for 1902 (see Report Chief of Engineers, 1903, p. 1112)	14,824,686
Increase	4,941,838

It will be noted that the above figures pertain to the calendar year 1903. They show that the value of the exports (foreign) exceeded those for the calendar year 1902 by $4,941,838, an increase of more than 33⅓ per cent.

Owing to the difficulty and delay in collecting domestic statistics it is impracticable to bring them up to the end of the fiscal year, but the foreign statistics for the fiscal year just ended have been published, and the following extract from an article from a local paper of July 8, 1904, in regard thereto may be of interest:

"The records at the custom-house show that 275 vessels of 90 tons and over entered and cleared at the port during the fiscal year just ended and that there were 27 entries of merchandise from abroad. One hundred and six documents were issued, consisting of enrollment and license of vessels, etc. But the most gratifying fact gathered from a comparison of the figures is that the value of exports during the fiscal year was $19,085,318, the increase over the preceding year being over $4,000,000. The value of exports more than doubles that of Norfolk and more than quadruples that of Charleston. Some of the figures of the present year may be interesting, the value of exports being as follows:

Cotton	$18,780,288
Rosin	157,709
Lumber	99,158
Miscellaneous	26,423
Shingles	8,870
Spirits	297
Tar	237
Total	19,085,315

Cotton steamers loaded at the port of Wilmington, N. C., during the calendar year ending December 31, 1903.

[Furnished by Messrs. Alexander Sprunt & Son.]

Name of steamer.	Registerd tonnage.	Draft, loaded.	Bales.
Torgarm	1,065	16.0	5,471
Vera	1,854	18.5	9,469
City of Gloucester	1,573	18.0	8,157
Polana	1,898	18.9	9,465
Muriel	1,564	18.6	7,515
Baron Innerdale	2,139	18.11	11,867
Stag	1,302	18.10	6,096
Finsbury	1,174	18.6	5,191
Axminster	1,231	15.9	5,967
Tolosa	2,099	18.6	10,700
Erna	957	19.0	3,700
Greatham	1,531	18.0	7,655
Falls of Keltie	2,150	18.0	11,365
Erica	1,201	17.6	4,900
Magdala	2,297	18.6	11,426
Baron Dalmeny	2,521	19.6	14,100
Baron Balfour	2,566	19.6	13,900
Candleshoe	2,466	19.2	13,162
Falcan	1,349	15.6	6,850
Haxby	2,252	19.0	10,875
Hesleyside	1,687	16.0	10,000
Oceano	3,050	18.9	16,117
Elton	1,595	19.0	8,377
Auchenblac	2,597	19.0	13,513
Stag	1,308	17.0	5,734
Bona	1,506	16.0	7,884
Heathford	2,436	19.0	13,260
Naparima	1,043	16.0	5,136
Tolosa	2,099	18.6	10,459
Gadsby	2,272	17.0	11,990
Anglo Saxon	2,671	20.6	17,000
Scarthoe	2,536	18.6	13,952
Huelva	1,690	17.0	8,480
Devonshire	2,363	19.0	12,300
Caprera	2,197	19.0	12,500
Tolosa	2,099	18.6	10,948
Total	68,338	....	355,481

EXTRACT FROM REPORT OF MR. ROBERT C. MERRITT, ASSISTANT ENGINEER.

OPERATIONS FOR THE YEAR.

The operations for the year have principally consisted of the work of the suction dredge *Cape Fear* on the Ocean Bar and Snows Marsh channels, and the clam-shell dredge *Ajax* on the river channels, and the removal of the Old Woodbury jetty, making repairs to New Inlet dam, making minor surveys, and repairing and caring for plant. All work was done by hired labor and United States plant.

The suction dredge *Cape Fear*, when working on Cape Fear River, was employed on the Ocean Bar channel when weather permitted and at other times at Snows Marsh channel. She was absent from the work, for repairs at Baltimore, Md., from July 1 to August 2, resuming work on the Ocean bar on August 4. From September 29 to January 17 she was absent for work in the Philadelphia, Pa., district, resuming work here on January 20. From March 31 to June 19 she was laid up here on account of exhaustion of funds, resuming work on June 20. She worked on Cape Fear River about four and one-half months during the year.

While at Baltimore the boat was given a pretty thorough overhauling, and, with minor repairs and a new boiler, should give good service for the next two or three years, by which time her stern will probably need rebuilding.

The amount of dredging done by the boat (in cubic yards, scow measurement) during the year and the location of the same is as follows:

Ocean Bar channel	145, 195
Snows Marsh channel	47, 035
Total	192, 230

The cost of this work may be summarized as follows:

Operating dredge.

Labor, operating	$3, 868. 72	
Subsistence	676. 22	
Fuel	2, 453. 98	
Engine supplies	233. 41	
Property, rope, etc	129. 85	
Minor repairs	667. 94	
Special repairs	14, 546. 10	
Repairs to windmill for supplying fresh water	48. 06	
Total cost		$22, 624. 28
Deduct as follows:		
Received from Savannah district, rentals	$3, 255. 00	
Received from Philadelphia district, rentals	3, 988. 15	
Received from sale of old yellow metal	530. 11	
Total receipts		7, 773. 26
Total cost of operating		14, 851. 02
Other expenses chargeable to the work:		
Superintendence and surveys	$1, 000. 00	
Rent, watching yard, etc., at Wilmington (part)	400. 00	
Operating steamer *Mercur* (part) inspection and survey boat	573. 38	
Operating launch *Nancy* (part) inspection and survey boat	50. 00	
Main office expenses (part)	650. 00	
Total cost of other expenses chargeable to the work		2, 673. 38
Total cost of operating, other expenses, etc		17, 524. 40

	Cents.
Cost per cubic yard for operating	7. 7
Cost per cubic yard, including all expenses	9. 1

This dredging cost much more per cubic yard this year than last, which is due to the fact that the boat was thoroughly overhauled and paid for by this appropriation, and all of the other appropriations having the use of the boat have not paid their part of the cost back to this appropriation. The Charleston district is due $5,145 and the Savannah district $1,557.50, making a total of $6,702.50. This amount would reduce each of the above costs 3.5 cents per cubic yard.

The clam-shell dredge *Ajax* has been continuously at work during the year. From July 1 to August 15 she was engaged on the removal of the Old Woodbury jetty, and since that time she has been continuously at work on restoring to 20 feet depth at mean low water the shoaled portion of the river channels that had been previously dug to that depth.

The amount of work done by this dredge during the year and the location of the same is as follows:

Name of shoal.	Cubic yards, scow measurement.	Stumps.	Logs.	Rock.
				Tons.
Lilliput	47,997		1	
Old Brunswick Cove	124,576		4	
Midnight	218,063	1		
Reaves Point	106,184		1	
Old Woodbury jetty				1,781
Total	496,820	1	6	1,781

The cost of this work may be summarized as follows:

Operating dredge *Ajax:*		
Labor operating	$6,264.66	
Subsistence	1,142.37	
Fuel	3,341.72	
Engine supplies	424.60	
Property, rope, etc	900.69	
Minor repairs	1,335.47	
		$13,409.51
Operating scows:		
Repairs to mud scows	413.42	
Repairs to coal and water scows	88.87	
Repairs to rock scows	133.80	
		636.09
Operating tug *Cynthia:*		
Labor operating	2,144.34	
Subsistence	400.93	
Fuel	1,281.30	
Engine supplies	46.57	
Property, rope, etc	309.65	
Minor repairs	259.11	
Special repairs	4,270.18	
		8,712.08
Operating tug *Caswell:*		
Labor operating	2,648.83	
Subsistence	559.52	
Fuel	1,647.16	
Engine supplies	258.94	
Property, rope, etc	207.97	
Minor repairs	1,015.79	
		6,338.21
Total cost		29,095.89
Deduct as follows:		
Received from Fort Caswell for spars	42.00	
Received from sale of old junk	14.00	
Total receipts		56.00
Total cost of operating plant		29,039.89

Other expenses chargeable to the work:

Superintendence and surveys	$2, 637. 96	
Rent, watching yard, etc., at Wilmington (part)	1, 000. 00	
Operating steamer *Mercur* (part), inspection and survey boat	1, 400. 00	
Operating launch *Nancy* (part), inspection and survey boat	134. 36	
Main office expenses (part)	1, 336. 21	
Total cost of other expenses chargeable to the work		$6, 508. 53
Total cost of operating and other expenses		35, 548. 42

This amount has been charged as follows:

Operating expenses to river channels	$25, 836. 48	
Other expenses to river channels	6, 152. 60	
Total to river channels		31, 989. 08
Operating expenses to Old Woodbury jetty	$3, 203. 41	
Other expenses to Old Woodbury jetty	355. 93	
Total to Old Woodbury jetty		3, 559. 34

Cost of dredging per cubic yard for operating, excluding logs and stumps	$0. 052
Cost of dredging per cubic yard for operating and other expenses, excluding logs and stumps	. 064
Cost of removing stone from Old Woodbury jetty per ton for operating	1. 80
Cost of removing stone from Old Woodbury jetty per ton for operating and other expenses	2. 00

In 1853 a commission recommended the protection of Baldhead Point from further abrasion, by jetties, estimating the cost at $40,000. In the summer of 1853 Captain Woodbury, Corps of Engineers, commenced the construction at Baldhead Point of a stone jetty 300 feet long, perpendicular to the outside beach, with a second jetty 100 feet long in the inner angle of the first, for its protection. Large stones were thrown together upon the first jetty for a length of 300 feet, and a heavy brush fence, about 1,500 feet long, was run parallel to the outer beach for the purpose of accumulating a barrier of sand against the overflow of that part of the beach by storm tides. During the summer of 1855 the jetties were extended by the addition of 680 tons of stone, and in 1856 an additional 600 tons of stone were placed on the jetties. The total cost of these jetties was about $46,000.

In September, 1871, a breach was formed around the inner ends of the jetties, and in December of the same year it was reported that considerable changes were taking place, involving the probable necessity of the removal of the jetties. In 1872 the breach inside of the jetty was 420 feet wide and 3 feet deep at low water. The width and depth of this breach continued to increase, and in 1899 the jetty was well in the channel. In 1903 the remains of the jetty were 11,000 feet from the high-water line on the shore, and between the two there was a channel with a maximum depth of more than 25 feet, and a width between the 22-foot contours of more than 400 feet. In March of the same year Captain Winslow, Corps of Engineers, recommended its removal to a depth of 25 feet at mean low water, the cost not to exceed $25,000. Colonel Hains, Corps of Engineers, stated that if it could be removed to a depth of 25 feet for anything like $25,000, that he would recommend its removal. Its removal was approved by the Chief of Engineers in April, 1903.

The clam-shell dredge *Ajax* was taken from her work on the river channels on May 23, and from that date to June 2 changes and repairs were made to fit her for the work of removing the jetty. An old 4-yard clam-shell bucket was fitted for the work of grappling the stone by rivetting four wrought-iron teeth on the outside of one shell and three on the outside of the other. These teeth were about 3½ feet long, 4½ inches wide, and 3½ inches thick at their thickest part; they were tapered at their points, which projected about 6 inches beyond the lips of the bucket. Extra anchors were obtained and new buoys made with a ring in the top arranged so that the anchor lines could be readily fastened to and detached from the anchors, enabling the dredge to get in position and away from the work with as little delay as possible.

The dredge began work on the removal of the jetty on June 4 and continued the work when tide, wind, and weather permitted until August 15, when the required depth was obtained. During this time 3,388 tons of large stone was removed. It was large granite of irregular shapes, many of the pieces weighing as much as 3 tons.

The jetty being located at the mouth of the river, exposed to the open sea, it was found necessary to tow the dredge and scows to Southport for a harbor at night, necessitating the loss of a part of the favorable weather each day that the dredge was able to work. She was able to work only a small part of forty-two days, there being only a few days that she could work a full day, and on more than half of the forty-two days she was only able to work one to three hours on the low-water slack.

When the dredge first began work there was less than 4 feet of water on the jetty, and a scow of about 100 tons could be loaded in from two to three hours, but as the work advanced more time had to be spent feeling for the stone, and on the last 120 tons dug she worked four days. The last stone removed was on August 8. The dredge was able to work only one day between the 8th and the 15th, and on that day she removed about 40 cubic yards of sand, but no stone.

The total cost of the removal of the jetty, allowing $1,500 for deterioration of plant, was $9,625.11, of which $3,559.34 was spent during the present fiscal year.

The rock removed was placed on New Inlet and Swash defense dams to make contemplated repairs, and was worth, I think, as much as $2 per ton, making the total value of the rock removed $6,776, thus reducing the cost of the removal to $2,849.11.

Special repairs were made to the steamer *Cynthia* during the year, consisting of taking out old boiler, purchasing and installing a new boiler, rebuilding stern and renewing other woodwork where rotten, overhauling machinery, and painting boat.

The steamer *Wright* placed the 1,781 tons of stone removed from the Old Woodbury jetty during the year on New Inlet and Swash Defense dams, the cost of which was as follows:

Labor operating	$682.46
Subsistence	174.25
Fuel	50.00
Engine supplies	5.00
Minor repairs	120.42
Main office expenses (part)	100.00
Total cost	1,132.13

Cost of placing on dam, per ton, 64 cents.

Repairs were made to New Inlet dam, consisting of patching coping, where damaged by storm, with stone received from the Old Woodbury jetty, and 351 tons of ballast rock was purchased and used in making repairs at the ends.

The cost of this work may be summarized as follows:

351 tons of ballast rock, at $1	$351.00
Labor	1,576.74
Arranging and repairing hoister	477.21
Property, rope, etc	100.85
Operating launch (part)	500.00
Operating steamer *Mercur* (part)	100.00
Rent, watching yard, etc., at Wilmington (part)	67.55
Superintendence (part)	250.00
Main office expenses (part)	250.00
Total cost of repairs	3,673.35

The cost of operating the steamer *Mercur* during the year may be summarized as follows:

Labor operating	$948.08
Subsistence	323.08
Fuel	396.38
Engine supplies	37.43
Property, rope, etc	8.86
Minor repairs	359.55
Total cost	2,073.38

This amount has been charged into the cost of the work as follows:

Ajax, dredging and removing jetty	$1,400.00
Cape Fear, dredging	573.38
Repairs to New Inlet dam	100.00

The cost of operating the launch *Nancy* during the year was $684.36, which has been charged into the cost of the work as follows:

Repairs to New Inlet dam	$500.00
Ajax, dredging and removing jetty	134 36
Cape Fear, dredging	50.00

The cost of the yard at Wilmington during the year was as follows:

Rent	$360.00
Labor, watching and caring for plant	991.74
Repairing buildings and arranging shops	115.81
Total cost	1,467.55

This amount has been charged into the cost of the work as follows:

Ajax, dredging and removing jetty	$1,000.00
Cape Fear, dredging	400.00
Repairs to New Inlet dam	67.50

The cost of superintendence during the year was $3,887.96, and has been charged into the cost of the work as follows:

Ajax, dredging and removing jetty	$2,637.96
Cape Fear, dredging	1,000.00
Repairs to New Inlet dam	250.00

Your office expenses during the year cost $2,336.21, and have been charged into the cost of the work as follows:

Ajax, dredging and removing jetty	$1,336.21
Cape Fear, dredging	650.00
Wright, placing stone on dams	100.00
Repairs to New Inlet dam	250.00

SUMMARY OF WORK AND EXPENDITURES.

Total amount spent during the year		$65,707.56
Deduct as follows:		
Received from Savannah district	$3,255.00	
Received from Philadelphia district	3,988.15	
Received from sale of old metal	530.11	
Received from Fort Caswell for spars	42.00	
Received from sale of old junk	14.00	
		7,829.26
Total cost during the year		$57,878.30
192,230 cubic yards dredging by dredge *Cape Fear*, at 9.1 cents	$17,524.40	
496,820 cubic yards dredging by dredge *Ajax*, at 6.4 cents	31,989.08	
1 stump removed by dredge *Ajax*.		
6 logs removed by dredge *Ajax*.		
1,781 tons of stone removed by dredge *Ajax*, at $2	3,559.34	
1,781 tons of stone placed on dams by steamer *Wright*, at 64 cents	1,132.13	
Repairs to New Inlet dam	3,673.35	
		57,878.30

All of the expenditures were for restoration and maintenance.

PRESENT CONDITION OF WORK.

At the ocean bar there is a 20-foot mean low-water channel from deep water inside to deep water outside, with a least width of 200 feet. The easterly movement of the channel in the vicinity of Baldhead Point has been very slight during the year. The old Woodbury jetty has been removed to a depth of 25 feet.

At Snows Marsh shoal an 18-foot channel has been maintained during the year. At Reaves Point and Midnight shoals the depth has been restored to 20 feet for a width of 148 feet. Old Brunswick Cove shoal has been restored to 20 feet depth and 148 feet width excepting a short place in the middle reach, where the depth is about 19 feet. Lilliput shoal is 148 feet wide and 20 feet deep excepting a short distance near the upper end, where the depth is about 19 feet. The above depths refer to mean low water. Other river channels are in approximately the same condition as at the beginning of the year.

New Inlet dam is in fair condition excepting for a short distance near the Zekes Island end, where the large coping is out of place. Swash Defense dam is in about the same damaged condition as at the beginning of the year, the only work done to it being the placing of part of the stone removed from the old Woodbury jetty in the worst breaks. Snows Marsh dike is almost obliterated. The sea beaches remain in practically the same condition.

Very respectfully, your obedient servant,

Robt. C. Merritt,
Assistant Engineer.

M 13.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

An allotment was made from this appropriation August 11, 1903, for removing the wreck of the bark *Anna* from the harbor at Beaufort, N. C.

This wreck was removed at cost of $250, and reported on under date of January 30, 1904.

M 14.

PRELIMINARY EXAMINATION AND SURVEY OF CARROT ISLAND SLOUGH AND LEWIS THOROUGHFARE, NORTH CAROLINA, FROM MIDDLE MARSHES TO NEWPORT RIVER.

[Printed in House Doc. No. 210, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 10, 1903.

Sir: I have the honor to submit herewith reports dated July 30, 1902, and July 20, 1903, by Capt. E. W. Van C. Lucas, Corps of Engineers, and his successor, Capt. E. Eveleth Winslow, Corps of Engineers, on preliminary examination and survey, respectively, of Carrot Island

Slough, North Carolina, beginning at a point opposite Middle Marshes, and thence through Carrot Island Slough and Lewis Thoroughfare to the main channel in Newport River, with a view of obtaining a navigable depth of 7, 8, 9, and 10 feet at mean low water. This examination was made in compliance with a requirement in the river and harbor act approved June 13, 1902, and the survey was ordered pursuant to the recommendation of Captain Lucas, in whose judgment the proposed improvement warranted such action.

Captain Winslow submits in his report estimates for the improvement of the locality by the excavation of channels of the depths proposed with a width of 80 feet at the bottom and suitable side slopes, and he states that such channels could be maintained at moderate cost, except in that portion of the route through Carrot Island Slough, through which the maintenance, in his judgment, would be expensive if not impossible. He suggests an alternative route through Taylors Creek, which he believes could be easily maintained after having been once dredged, but the estimated first cost would be about 25 per cent greater than that through Carrot Island Slough. He also presents estimates on the basis of channels 5 and 6 feet deep, respectively, and 60 feet wide for the Taylors Creek route. The lowest estimate for any improvement proposed by him is $45,000, but he is of the opinion that the expenditure of even this sum is not justifiable at the present time.

The views of Captain Winslow are concurred in by the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers, by the Board of Engineers for Rivers and Harbors, which has reviewed these reports under the provisions of sections 3 and 14 of the above-mentioned act, and by me.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. E. W. VAN C. LUCAS, CORPS OF ENGINEERS.

United States Engineer Office,
Wilmington, N. C., July 30, 1902.

General: In compliance with instructions contained in letter from your office, dated the 23d ultimo, I have the honor to submit the following preliminary report on—

Carrot Island Slough, beginning at a point opposite Middle Marshes, and thence through Carrot Island Slough and Lewis Thoroughfare to the main channel in Newport River, with a view of obtaining a navigable depth of 7, 8, 9, and 10 feet at mean low water.

No preliminary examination is necessary, there being on file sufficient data for a preliminary report.

Carrot Island Slough is a narrow and shallow channel, connecting Beaufort Harbor with the approaches to Core Sound, and its deepening, which is quite practicable, is desired for the use of about two hundred small vessels in their frequent trips to and from Core Sound, in order to avoid the rough and sometimes dangerous crossing of the inlet, which is now necessary to get to or from either Beaufort or Morehead City. In stormy weather this crossing is often impossible, and cargoes of perishable freight are sometimes lost through delays due to such storms.

The country bordering on Core Sound and its numerous tributary streams, extending about 40 miles to the eastward of Beaufort, receives its supplies from Morehead City or Beaufort, and sends its produce in return. This commerce amounted in 1901 to about 50,000 tons, and was all transported in small sailing vessels or launches, all of which are directly interested in the proposed deepening of Carrot Island Slough, which would afford a protected and certain route past the inlet.

In my judgment this proposed improvement possesses sufficient merit to warrant a survey, which can be made for about $300 and which is recommended. There is a balance of about $3,000 to the credit of Beaufort Harbor, and as the improvement would directly benefit the harbor, it would seem that the cost of the proposed survey could properly be met from this balance, otherwise an allotment of $300 will be necessary.

Very respectfully, E. W. VAN C. LUCAS,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 8, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

The district engineer reports the slough of sufficient merit to warrant a survey, but he does not report that the slough is worthy of improvement, which is indispensable under the law before a survey can be made.

It is recommended that this paper be returned with request for the expression of an opinion by the district engineer upon the latter point.

PETER C. HAINS.
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 16, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 30, 1902.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Captain Lucas on the preliminary examination of Carrot Island Slough, North Carolina.

In the opinion of the Board the commerce involved is of such extent and character as to warrant a limited improvement of the locality by the General Government, provided such improvement can be made at reasonable cost.

The Board therefore recommends that there be made an allotment of $300 from the appropriation for preliminary examinations, surveys, and contingencies of rivers and harbors with which to make a survey and estimate of cost. It is requested that the district officer in his report transmitting the survey indicate more in detail the character and extent of the commerce which would be affected by the improvement.

For the Board:

A. MACKENZIE,
Colonel, Corps of Engineers,
Senior Member.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
January 7, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Carrot Island Slough and Lewis Thoroughfare, North Carolina, authorized by the river and harbor act of June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors in the preceding indorsement, I recommend that a survey of the locality as proposed be authorized.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

[Fifth indorsement.]

WAR DEPARTMENT,
January 13, 1903.

Approved as recommended by the Chief of Engineers.

WM. CARY SANGER,
Assistant Secretary of War.

[Sixth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
July 27, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors with report on survey recommended in third indorsement hereon.

A. MACKENZIE,
Acting Chief of Engineers.

[Seventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 31, 1903.

Repectfully returned to the Chief of Engineers, United States Army.

The Board has considered the accompanying report on a survey of "Carrot Island Slough, beginning at a point opposite Middle Marshes, and thence through Carrot Island Slough and Lewis Thoroughfare to the main channel in Newport River, with a view of obtaining a navigable depth of seven, eight nine, and ten feet at mean low water," and the indorsement of the division engineer thereon.

For the reasons stated in that report the Board concurs with the district officer and the division engineer that it is not advisable for the United States to undertake the improvement of Carrot Island Slough and Lewis Thoroughfare.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

SURVEY OF CARROT ISLAND SLOUGH AND LEWIS THOROUGHFARE, NORTH CAROLINA, FROM MIDDLE MARSHES TO NEWPORT RIVER.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., July 20, 1903.

GENERAL: In compliance with the Department's letter of January 21, 1903, I have the honor to submit my report upon the survey of "Carrot Island Slough, beginning at a point opposite Middle Marshes, and thence through Carrot Island Slough and Lewis Thoroughfare to the main channel in Newport River, with a view of obtaining a navigable depth of 7, 8, 9, and 10 feet at mean low water." This report is supplemental to the report submitted July 30, 1902, by my predecessor in this office, Capt. E. W. Van C. Lucas, Corps of Engineers, upon a preliminary examination of this same locality. A map[a] of the locality is submitted.

The route of the channel as stated in the act is about 26,000 feet long; of this distance 23,840 feet will require dredging to obtain a 7-foot channel, and 24,660 feet if 10 feet is desired. This route is naturally divided into three parts, (1) from the Middle Marshes channel through Carrot Island Slough to the city front of Beaufort; (2) from Beaufort to the Bulkhead channel; (3) from this channel through Lewis Thoroughfare to Newport River.

The first part of the route, Carrot Island Slough, is a shallow passage between Bird Island and Carrot Island. Bird Island is a sand shoal submerged at high water. The bottom of the slough is composed of shifting sands, and the least depth at present is less than 1 foot at low water.

The second part of the route commences at the water front of Beaufort and extends to the Bulkhead channel. In front of Beaufort the available depth at low water is at present 6 feet. The channel from Beaufort around Town Marsh to the Bulkhead channel was dredged about ten years ago by the United States to 7 feet. This dredged cut has maintained itself fairly well, and there is at present through it an available channel of not less than 6 feet.

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[a] Not printed.

The third part of the route from Bulkhead channel through Lewis Thoroughfare runs between a number of marshy islands. Its least depth at present is about 2½ feet.

The volumes of dredging required for channels of the different depths stated in the act are given in the following table:

Cubic yards of dredging required.

	7 feet.	8 feet.	9 feet.	10 feet.
Middle Marshes to Beaufort	316,100	421,700	535,600	666,400
Beaufort to Bulkhead channel	2,600	9,460	18,000	33,200
Bulkhead channel to Newport River	42,000	63,140	88,700	124,700
Total	360,700	494,300	642,300	824,300
Cost at 15 cents per cubic yard	$54,105	$74,145	$96,345	$123,645

The above estimates are for a channel 80 feet in width at the base, with suitable side slopes.

If a channel were dredged to any of the above depths, it is believed that in the second and third divisions of the route the depths once obtained could be maintained at moderate cost, but in the first division, or the Carrot Island Slough part of the route, it is thought that the maintenance would be expensive, if not impossible, owing to the cross currents passing at high water over Bird Island and the shifting character of the sand bottom.

There is, however, an alternative route which would obviate this difficulty of maintenance. This route is to the north of Carrot Island Slough through Taylors Creek, and being protected by Carrot Island from cross currents, it is believed that a channel once dredged could be easily maintained. The bottom of the creek is composed of mud and shells. At present part of it is dry at low water. Not being mentioned in the act this route was not surveyed, but there are enough data in the office to enable a close estimate to be made of the cost of its improvement. In general terms, it may be stated that the first cost of a channel by this route will be about 25 per cent greater than that through Carrot Island Slough, but it is believed that the greater first cost would be more than compensated for in a few years by the saving in maintenance.

The improvement desired is for the use of 16 small steamers, 23 naphtha launches, and 308 sailing vessels which ply from Beaufort and the railroad at Morehead City to various points in Core Sound. These vessels are now all compelled to pass through the channel to the southward of Bird Island shoal, across and close to Beaufort Inlet. This passage is usually rough, and in stormy weather is dangerous and frequently impossible.

The total commerce of Beaufort Harbor for the calendar year 1902 amounted to 78,983 tons, valued at about $400,000, composed principally of fish, oysters, and similar items requiring quick or at least uninterrupted transportation to market. It is estimated that about two-thirds of this commerce would be affected by the proposed improvement. As the governing depth in Core Sound does not exceed 5 or 6 feet, and there is but little tide, this commerce is necessarily carried on in vessels of less than 6 feet draft. In fact most of the vessels draw less than 4 feet.

The estimate of the cost of a channel along the route stated in the act and of the least depth mentioned therein, 7 feet, is about $54,000. Of this expenditure nearly 90 per cent will be for the dredging in Carrot Island Slough where, as stated, it is believed that such a cut will be soon practically obliterated. If the alternative route through Taylors Creek is chosen, the cost will be increased to about $65,000. Such an expenditure is, in my opinion, not justified, especially as vessels are limited by natural causes to a draft of but 6 feet.

If the improvement be viewed upon the basis of channels of 6 and 5 feet depth, respectively, and only 60 feet in width, the cost would be for the 6-foot channel about $52,000, and for the 5-foot channel about $45,000, the Taylors Creek route being taken in both cases for reasons above stated.

Upon a comparison of the cost of improving the locality to the different extents considered, and the value of the commerce to be benefited, the expenditure of even the smallest amount is, in my opinion, not justifiable at the present time though, should Beaufort Inlet become the actual terminus of the proposed inland waterway, the commercial value of the locality might increase to such an extent as to justify the improvement.

Very respectfully, E. EVELETH WINSLOW,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE OF DIVISION ENGINEER, SOUTHEAST DIVISION,
Savannah, Ga., July 22, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

The opinions and recommendations of the district engineer are concurred in.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

M 15.

PRELIMINARY EXAMINATION OF INDIAN ISLAND SLOUGH, NORTH CAROLINA, FROM PAMLICO RIVER TO MOUTH OF SOUTH RIVER.

[Printed in House Doc. No. 113, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 1, 1903.

SIR: I have the honor to submit herewith a report, dated July 29, 1902, by Capt. E. W. Van C. Lucas, Corps of Engineers, and report supplementary thereto, dated April 23, 1903, by his successor, Capt. E. Eveleth Winslow, Corps of Engineers, on preliminary examination of Indian Island Slough, North Carolina, from Pamlico River to the mouth of South River, with a view of obtaining a depth of 7, 8, and 9 feet, respectively, and 100 feet wide, or as wide as may be necessary. This examination was ordered by the river and harbor act approved June 13, 1902, and Captain Winslow submits estimates ranging from $4,462.50 to $19,250 for channels of the depths mentioned, with widths of 100 and 200 feet. He states that a channel 7 feet deep and 200 feet wide would be all that is at present required by the commerce of the slough, the estimated cost being $8,000, and it is his opinion that the locality is worthy of improvement to that extent, but the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers, in forwarding the report, expresses the opinion in his report of April 29, 1903, that the slough is not worthy of improvement by the General Government.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors in accordance with the provisions of sections 3 and 14 of the above-mentioned act, and the Board concludes in its report of July 22, 1903, that it is not desirable for the United States to undertake this improvement.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. E. W. VAN C. LUCAS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., July 29, 1902.

GENERAL: In compliance with instructions contained in letter from your office, dated the 23d ultimo, I have the honor to submit the following preliminary report on "Indian Island Slough, from Pamlico River to mouth of South River, with a view of obtaining a depth of 7, 8, and 9 feet, respectively, and 100 feet wide, or as wide as may be necessary."

No preliminary examination is necessary, there being on file sufficient data for this report.

Indian Island Slough is a shallow channel connecting Pamlico River and South River (or Creek) over a shoal extending from the end of the left bank of South River to Indian Island, which lies at the mouth, just north of the main channel. For light-draft vessels the slough offers a short cut by which a saving of 6 to 10 miles can be made in the passage between South River and upper Pamlico River. The present governing depth is 4 to 5 feet in a very narrow channel, and the Government is asked to deepen this channel enough to permit of its passage by all vessels navigating the neighboring waters.

South Creek is the sole outlet for a considerable section of good farming and timber land, and in 1901 its commerce amounted to over 35,000 tons and 7,000 passengers. About 5,000 tons of this freight consisted of vegetables, which require the quickest possible means of transportation to be profitably marketed. The neighboring lands are favorable for a considerable increase of such produce, which is the most profitable crop raised in the vicinity. It is shipped up Pamlico River to Washington, N. C., about 30 miles distant, where rail shipments can be made.

It is claimed that the saving in time to Washington that would result from deepening the slough would make possible better transportation facilities and cheaper freight and passenger rates. It would also make possible the establishment of a daily mail service between Washington, the villages on South Creek, and Swan Quarter, in Hyde County.

The absolute merit of this proposed improvement can not be determined without a survey and estimate of cost, which can be made for $75, but it is apparently of sufficient importance to warrant this small expenditure, which is recommended. An allotment of $75 should be made for the purpose, as no funds are available.

Very respectfully,

E. W. VAN C. LUCAS,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 8, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

The district engineer reports that the absolute merit of this proposed improvement can not be determined without a survey; but as I understand section 14 of the river and harbor act of June 13, 1902, a survey can not be made until the slough is reported worthy of improvement.

It is recommended that the district engineer be requested to revise the report to accord with the law.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
May 4, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brigadier-General Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 22, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within and the accompanying reports of the district officer on a preliminary examination of "Indian Island Slough, from Pamlico River to mouth of South River, with a view of obtaining a depth of 7, 8, and 9 feet, respectively, and 100 feet wide, or as wide as may be necessary," and the indorsements of the division engineer thereon.

The commerce of South River is carried on in vessels drawing not more than 7 feet. It would therefore be useless to provide a greater depth than this in Indian Island Slough. The district officer proposes to provide by dredging a channel 7 feet deep and 200 feet wide at an estimated cost of $8,000.

The benefit of such a channel would be confined to vessels drawing between 5 and 7 feet, since vessels drawing more than 7 feet can not engage in the commerce of South River, and vessels drawing less than 5 feet can pass through the channel at present existing in Indian Island Slough. Even the vessels benefited might not be able to beat through the improved channel in certain winds; and at the best the improvement, as stated by the division engineer, would simply be a convenience.

The commerce of South River is reported to reach the comparatively large amount of 80,000 tons annually, but the extent to which this would be benefited by the proposed improvement is small.

The Board is of opinion that it is not desirable for the United States to undertake the improvement of Indian Island Slough, North Carolina.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

SUPPLEMENTARY REPORT ON PRELIMINARY EXAMINATION.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., April 23, 1903.

GENERAL: In compliance with the instructions of the Department to my predecessor in this office, dated September 11, 1902, I have the honor to submit herewith a report upon a survey of Indian Island Slough, North Carolina, from Pamlico River to mouth of South River, together with a map[a] of the locality.

This report is supplementary to the preliminary report submitted by my predecessor, July 29, 1902.

Indian Island Slough is a shallow depression connecting Pamlico and South rivers, North Carolina, across a shoal extending from the end of the left bank of South River to Indian Island. As shown by the survey this slough is navigable to a depth of about 5 feet at mean low water.

South River (or Creek), with its tributaries, is the only outlet for a considerable section of good farming and timber land, and its commerce during the calendar year 1902 is estimated at about 80,000 tons, valued at about $560,000. The principal exports from this section consisted of cotton, lumber, and truck produce, the latter requiring quick transportation to market.

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[a] Not printed.

All of this commerce is necessarily carried by water and most of it in sailing vessels. The larger part of it is with Washington, N. C., about 30 miles up the Pamlico River.

For all of this commerce with Washington the distance would be shortened by about 8 miles if the slough were navigable, and, besides, by passing through the slough vessels would avoid the rough water frequently met with in rounding the island. All small vessels that can do so now use the slough, and though not an absolute necessity it would be of great advantage to commerce in time, and especially in safety, if it all could be carried through.

The river and harbor act of June 13, 1902, provided for a preliminary examination and survey of "Indian Island Slough, from Pamlico River to mouth of South River, with a view of obtaining a depth of 7, 8, and 9 feet, respectively, and one hundred feet wide, or as wide as may be necessary."

Based on the survey, it is estimated that the cost of obtaining by dredging a channel of the different depths mentioned and of different bottom widths would be about as given in the following table:

	Depth.	Bottom width.	Excavation.	Price.	Cost.
	Feet.	*Feet.*	*Cubic yards.*	*Cents.*	
Channel	7	100	12,750	35	$4,462.50
Do	7	200	22,550	35	7,892.50
Do	8	100	22,400	30	6,720.00
Do	8	200	37,000	30	11,100.00
Do	9	100	47,250	25	11,812.50
Do	9	200	77,000	25	19,250.00

The survey further shows, when compared with former examinations, that the slough is now deeper than it used to be, and this is supposed to be partly due to the soft mud being stirred up by the vessels now using this passage and being carried away by the current. From this it is believed that its improvement to a moderate degree would be fairly permanent.

The channel of South River near Indian Island is navigable to a depth of 10 feet, but before reaching Aurora or any of the other towns shoals must be crossed, and by these shoals the navigation of the river is practically limited to a depth of about 7 feet, and its commerce is all carried on in vessels requiring not more than that depth. Consequently, if the slough should be opened to a depth of 7 feet and a width of about 200 feet, it would be all that is at present required by its commerce. Such an improvement would cost about $8,000.

On account of its small cost and its probable permanency and the comparatively large amount of commerce to be benefited, it is believed that Indian Island Slough is worthy of improvement to the extent named.

Very respectfully,

E. EVELETH WINSLOW,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 29, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

The improvement of the slough does not appear to be essential to enable vessels to enter the Pamlico River from South River. The proposed improvement would simply be a convenience, and, in this light, I do not believe it is worthy.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

M 16.

PRELIMINARY EXAMINATION AND SURVEY OF LIVINGSTON CREEK, NORTH CAROLINA.

[Printed in House Doc. No. 249, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1903.

SIR: I have the honor to submit herewith reports dated September 9, 1902, by Capt. E. W. Van C. Lucas, Corps of Engineers, and June 10, 1903, by Capt. E. Eveleth Winslow, Corps of Engineers, on preliminary examination and survey, respectively, of Livingston Creek, North Carolina, made in pursuance of a requirement in the river and harbor act of June 13, 1902.

Captain Winslow presents two projects for improvement, viz, by snagging at an estimated cost of $2,000, and by dredging, to obtain a 5-foot channel 40 feet in width and to cut off the sharpest bends, at an estimated cost of $3,500. For reasons stated, he considers the locality worthy of improvement by snagging at a cost of $2,000, and this opinion is concurred in by the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors under the provisions of sections 3 and 14 of the above-mentioned act, and the Board expresses the opinion in its report of July 22, 1903, that it is desirable for the United States to improve the locality by snagging, at a first cost of $2,000, in conjunction with snagging operations on the Cape Fear River.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

PRELIMINARY EXAMINATION OF LIVINGSTON CREEK, NORTH CAROLINA.

United States Engineer Office,
Wilmington, N. C., September 9, 1902.

General: In compliance with instructions contained in letter from your office, dated July 10, 1902, I have the honor to submit the following report on preliminary examination of Livingston Creek, North Carolina:

Livingston Creek is a small tributary of the Cape Fear River, which it enters from the right bank about 30 miles above Wilmington. It is navigable for about 5 miles from its mouth to the Seaboard Air Line crossing at Cronly, N. C., and its improvement is desired by several manufacturing concerns and lumbermen. The present commerce is carried on flatboats and timber rafts, but navigation is very slow and unsatisfactory, because the water is too deep for poling and tugboat owners will not risk their vessels in the stream on account of many dangerous snags, so that flats and rafts are compelled to work ahead by hooking to branches and trees along the banks.

The width is between 50 and 150 feet and the depth from 10 to 20 feet, excepting for three short shoals over which the low-water depth is 2 or 3 feet. There are a few points that can advantageously be trimmed.

The commerce amounts to about 14,000 tons annually, consisting principally of brick, pine straw, timber, and general merchandise; and the item of pine straw will increase hereafter by about 5,000 tons annually on account of recent extensive additions to the plant of the American Pine Fiber Company, which corporation has invested $200,000 in their manufacturing plant at Cronly.

The probable cost of the desired improvement will not exceed $5,000, which will include dredging through shoals, cutting off points, and thoroughly snagging the stream; but an accurate estimate can not be made without a survey to cost $200.

The amount of the present commerce, in my judgment, justifies an appropriation sufficient to put this stream in a condition so that small tugs can navigate, which is the principal thing desired; and I therefore recommended that a survey be authorized and an allotment of $200 be made, no funds being available for the purpose.

Very respectfully,

E. W. Van C. Lucas,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. Engineer Office,
Baltimore, Md., September 12, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

Approval is recommended.

Peter C. Hains,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 17, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 30, 1902.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Captain Lucas on the preliminary examination of Livingston Creek, North Carolina, and the indorsement of the division engineer upon the same.

In the opinion of the Board the commerce involved is of such extent and character as to warrant a limited improvement of the locality by the General Government, provided such improvement can be made at reasonable cost.

The Board therefore recommends that there be made an allotment of $200, as requested by the district officer, with which to make a survey and estimate of cost. It is requested that the district officer indicate in his report upon the survey the relation of the proposed improvement to the project for locks and dams upon Cape Fear River, particularly with respect to the location of the dam nearest the mouth of the latter, as to whether such dam would fall below the mouth of Livingston Creek, and its probable influence upon this stream. It is also requested that the district officer state in such report the present and prospective commerce of this stream in greater detail than appears within.

For the Board:

A. MACKENZIE,
Colonel, Corps of Engineers,
Senior Member.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
January 7, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Livingston Creek, North Carolina, authorized by the river and harbor act of June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors in the preceding indorsement, I recommend that a survey of the locality as proposed be authorized.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

[Fifth indorsement.]

WAR DEPARTMENT,
January 9, 1903.

Approved as recommended by the Chief of Engineers.

WM. CARY SANGER,
Acting Secretary of War.

[Sixth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
June 24, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors with report of survey as recommended.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Seventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 22, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the accompanying report of the district officer on the survey of Livingston Creek, North Carolina, and the indorsement of the division engineer thereon.

For reasons stated in said report, the Board concurs with the district officer and the division engineer in the opinion that the extent of commerce to be benefited and the relation of estimated cost to benefits to be obtained are such as to make it desirable for the United States to improve Livingston Creek, North Carolina, by snagging, at a first cost of $2,000, in conjunction with snagging operations on the Cape Fear River. The question of maintenance should be left to be determined by the effect of the work proposed upon commerce.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

SURVEY OF LIVINGSTON CREEK, NORTH CAROLINA.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 10, 1903.

GENERAL: In compliance with the instructions of the Department dated January 17, 1903, I have the honor to submit the following report upon the survey of Livingston Creek, North Carolina. together with a map[a] of the locality, resulting from said survey.

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[a] Not printed.

Livingston Creek is a small tributary of the Cape Fear River, which it enters from the right hand about 30 miles above Wilmington. About 4 miles from its mouth this creek is crossed by the Carolina Central Railroad (Seaboard Air Line) near the town of Cronly, and as far as navigation is concerned only the part below this bridge is worthy of consideration.

This part of the creek is a tide-water stream, there being a normal oscillation of about 1 foot at the mouth and 9 inches at Cronly. The discharge proper of the stream is very small, but during freshets in the Cape Fear this part of the creek is filled with backwater from the river, the rise under such conditions amounting to as much as 15 feet. During such freshets there is of course a large deposit of sediment.

The creek is excessively crooked, consisting of a succession of sharp bends; its depth varies from over 20 feet to a minimum of about 4 feet; its width is very irregular, varying from 50 to 200 feet. As, however, the Cape Fear is seldom at its lowest stage, and as there is usually some tide, there is almost constantly an available channel deeper than 4 feet. With the exception of 6 short shoals, each from 100 to 400 feet long, there is a navigable channel of not less than 5 feet in depth at low water. In addition to the shoals navigation is impeded by snags, sunken logs, overhanging trees, and sharp bends.

The town of Cronly is supposed to contain about 250 inhabitants. Located here, or in its immediate vicinity, are 4 country stores, 1 pine-fiber factory, 1 fertilizer factory, 1 brick kiln, 4 turpentine stills, and 1 mattress factory, the latter not in operation.

The present commerce of the creek is carried on by flatboats, timber rafts, and 1 small tug. The flatboats, when loaded, require about 4½ feet, the tug 4 feet. The detailed items of the commerce are as follows:

Articles.	Tons.	Value.
Outward bound:		
2,000,000 brick	6,000	$12,000
3,500 cords of pine wood	3,500	7,000
100,000 shingles	60	500
500,000 feet timber	1,000	3,000
10,000 cross-ties	1,000	2,000
700 barrels naval stores	100	2,500
	11,660	27,000
Inward bound:		
Pine straw	3,000	9,000
General merchandise	200	5,000
	3,200	14,000
Total	14,860	41,000

The present available channel is sufficiently deep for the vessels using it, but the principal impediment to commerce comes from the snags, overhanging trees, and sharp bends. For flatboats the water is in many places too deep for poling, while the tugs are afraid of the snags and find difficulty in turning the sharp bends. The latter trouble can not be remedied except at an expenditure not justified by the amount of the commerce; but were the snags removed the stream could be used by small tugs, and this is about all the improvement that is at present desired.

The extent to which the total amount of commerce would be affected by the improvement of the creek is problematical, and would depend largely upon the extent of the improvement. It is thought, though, that were the stream improved by the removal of the snags the pine fiber and the fertilizer factories, and possibly the other interests, would probably use it to a greater extent than at present, but it is not believed that this increase would amount to more than about 5,000 tons per annum.

The estimated cost of improving this creek is about as follows:

Snagging 4⅓ miles, at $400 per mile	$1,733
Superintendence and contingencies	267
Total	2,000

To dredge the creek so as to obtain a 5-foot channel 40 feet in width, and to cut off the sharpest bends would require—

10,000 cubic yards of dredging, at 30 cents	$3,000
Contingencies	500
Total	3,500

It is believed that this improvement, if obtained, would be of doubtful permanency; the shoals would probably re-form after each large freshet in the Cape Fear River, and the snagging would have to be done over again from time to time. The maintenance would probably average about $1,000 per annum, of which about one-fourth would be required for snagging.

In view of the small amount of the present and prospective commerce of the stream and of the fact that any improvement would have but little permanency, it is not thought that the stream is worthy of improvement to any large extent, but owing to the proximity of the Cape Fear River, and the fact that there is on that river a snagging plant, it is believed that it would be expedient to improve the creek by snagging at an estimated cost of $2,000.

The mouth of the stream is situated several miles below any probable lock site on the Cape Fear, so that it would not be affected by the canalization of that river.

Very respectfully,
E. EVELETH WINSLOW,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Savannah, Ga., June 13, 1903.

Respectfully submitted to the Chief of Engineers, United States Army, with recommendation that the project for the improvement be approved to the extent recommended.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

M 17.

PRELIMINARY EXAMINATION OF LOCKWOOD FOLLY RIVER, NORTH CAROLINA.

[Printed in House Doc. No. 229, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 1, 1903.

SIR: I have the honor to submit herewith, for transmission to Congress, a report dated January 26, 1903, by Capt. E. E. Winslow, Corps of Engineers, on preliminary examination of Lockwood Folly River, North Carolina, authorized by the river and harbor act approved June 13, 1902. For reasons stated Captain Winslow reports the river not worthy of further improvement. The division engineer, Col. P. C. Hains, Corps of Engineers, concurs in this opinion.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of said act, and attention is respectfully invited to the Board's report of April 17, 1903, in third indorsement thereon.

It appears that this stream was under improvement by the General Government from 1892 to 1897, and that the existing channel is believed to be ample for the present and prospective needs of the commerce involved, which is small in quantity and local in character.

I concur in the conclusions of the Board that it is not desirable that the United States should undertake the further improvement of Lockwood Folly River at this time.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. E. EVELETH WINSLOW, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., January 26, 1903.

GENERAL: In compliance with your instructions to my predecessor in this office, I have the honor to submit the following report upon the preliminary examination of Lockwood Folly River, North Carolina:

Lockwood Folly River is a small stream located in the southeastern part of North Carolina, and empties into the Atlantic Ocean at a point 12 miles west of the mouth of the Cape Fear River. It is navigable for a distance of about 21 miles up to a county bridge at the post-office of Supply.

Two previous examinations of this river have been made, the first in 1880 and the other in 1887. The reports on these examinations will be found in the Annual Reports of the Chief of Engineers for 1880, page 909, and for 1887, page 1099. According to this last report the channel of the river was not less than 6 feet deep at low water as far as the town of Supply, except over a series of shoals covering about 3 miles of river, over which there was only from 1 foot to 1½ feet at low water. The river was reported to be worthy of improvement by the Government, and appropriations for the work were made by Congress in 1890, 1892, and 1894, the total of these appropriations being $18,000.

With the money made available by these appropriations some dredging was done in the river under a project to obtain in this manner a channel 100 feet wide and 7 feet deep at low water, the estimated cost of which was at first $40,000 and was subsequently increased to $65,000. Work was begun in 1892 and was completed in 1897, and resulted in securing a channel of 40 feet least width and 5 feet least depth at mean low water from the inlet to Lockwood Folly Bridge, except through two short shoals having a depth of 3½ and 4½ feet, respectively. The reports of this work will be found in the Annual Reports of the Chief of Engineers for 1891, page 1402; 1892, page 1177; 1893, page 1432; 1894, page 1056; 1895, page 1345; 1896, page 1140, and 1897, page 1417.

Since 1897 no work has been done upon this river, and its present condition is as follows: There is a navigable channel not less than 5 feet deep at low water except at two places. On one of these there is at present an available depth of about 4½ feet. This is near the mouth of the river, and is one of the shoals referred to above as being left after the cessation of operations in 1897. The other shoal is situated about 4 miles above the mouth of the river, and through it there is at the present time available a low-water channel of about 3 feet in depth. This shoal is short, being only about 150 yards in length. At this point considerable dredging was done during the progress of the improvement, but its location is such that the increased depth has not been maintained. With the exception of the shoal just mentioned the dredged cut has been maintained by the river current to practically the full depth dredged, and in some places a noticeable scour has taken place. The material removed by the dredge was dumped in a long bank forming a border for the channel. In some places this bank has been breached, and through these breaks there are, at certain stages of the tide, strong cross currents which seriously interfere with the navigation of the river. The river for some miles below the bridge is partially obstructed by snags. No examination was made of the bar, but boatmen who use the channel through it report that there is at low water an available depth of at least 5 feet.

There is a tidal rise in this river of about 4½ feet near the inlet, gradually decreasing to about 2 feet at the bridge; and the navigable depths given above at low water are therefore increased by this difference at high water. There is therefore as far as Supply a navigable channel at and near high water of not less than 5 feet in depth. This is believed to be ample for the vessels now navigating it, and it is not believed that the commerce is of sufficient importance to justify larger vessels to engage in this trade.

The improvement to be desired in this river is the removal of the shoals and of the troublesome snags; and the closing, or the partial closing, of the breaks in the old bank. The removal of the shoals would require the dredging of about 10,000 cubic yards of material, and it is certain that the improvement thus obtained would be only temporary. To close the breaks in the bank would require the construction of about 500 linear feet of pile dike, but it is probable that such a dike would be destroyed by the teredo in a few years. Any other form of dike would be very expensive.

The estimate of the cost of the above work is as follows:

10,000 cubic yards of dredging, at 30 cents	$3,000
500 linear feet of dike, at $5	2,500
Snagging 12 miles of river, at $200 per mile	2,400
Superintendence, contingencies, about 20 per cent	1,600
	9,500

The exports from this section of the country are: Cotton, produce, fish and oysters, naval stores, lumber, and its products. It is estimated that the total amount of exports and imports to and from this region does not exceed 5,000 tons per annum, of an estimated value of $100,000. Since the beginning of the work of improvement there has been a gradual increase in the commerce of this river, but the increase will probably be changed to a decrease in the coming year, as a large mill, the lumber of which has formed the largest single item of commerce of the river, is about to close, owing to the exhaustion of the timber supply.

Practically all of the produce of this region is sent to Wilmington, and practically all their supplies are drawn from this point. If sent overland, this merchandise must be hauled over sandy roads a distance of about 30 miles. If sent by water, they must be taken down Lockwood Folly River across the bar, through the open ocean for a distance of about 12 miles, and then up the Cape Fear River. This trade is carried on exclusively by sailing vessels and is naturally subject to frequent delays on account of the weather and from other causes. It is estimated that it requires ordinarily about two weeks to make the trip from Supply to Wilmington and back. Under the circumstances the delay of a few hours waiting for a high tide at the shoal is of but little importance.

There is inclosed a sketch[a] showing the depth of the river channel at various points, the location of the shoals, and the breaks in the bank.

From a consideration of the facts stated above, the amount of the commerce of the river, its probable decrease in the future, the difference in time necessary for the overland and water trip, the facts that at high water the navigable depth is sufficient for the vessels now using the river, and that any improvement obtained will be only temporary and will require constant maintenance, it is my opinion that the river is not worthy of further improvement.

No further survey is recommended.

Very respectfully,
E. Eveleth Winslow,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

---

[a] Not printed.

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., January 29, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

I concur in the views of the district engineer.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
February 5, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., April 17, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer and the indorsement of the division engineer thereon.

This river was under improvement by the General Government from 1892 to 1897. Dredging operations during this period resulted in a channel with a least depth of about 5½ feet at high tide. The channel appears to have maintained itself fairly well, except at one shoal, where no dredging can be expected to have a permanent beneficial effect.

The commerce is small and local in character, and the existing channel is believed to be ample for present and prospective needs.

For the reasons stated, the Board is of opinion that it is not desirable that the United States should undertake the further improvement of Lockwood Folly River, North Carolina.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

M 18.

PRELIMINARY EXAMINATION AND SURVEY OF NEUSE RIVER, NORTH CAROLINA, FROM GOLDSBORO TO NEWBERN.

[Printed in House Doc. No. 648, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, March 28, 1904.

SIR: I have the honor to submit herewith, for transmission to Congress, reports of August 22, 1902, by Capt. E. W. Van C. Lucas, Corps of Engineers, upon preliminary examination, and of December 12, 1903, by Capt. R. P. Johnston, Corps of Engineers, upon survey of Neuse River, North Carolina, "from Goldsboro to Newbern, with a view of securing a depth of 3 feet," authorized by the river and harbor act of June 13, 1902.

Neuse River is at present being improved by the United States under a project which provides for securing a channelway clear of obstructions and 8 feet in depth from the mouth up to Newbern, 4 feet in depth up to Kinston, and 3 feet deep during 9 months of the year up to Smithfield, 56 miles above Goldsboro. The object of the present investigation is to secure a depth of 3 feet throughout the entire year between Newbern and Goldsboro.

As a result of the preliminary examination it appeared that the stream would be worthy of the further improvement proposed, provided the work could be accomplished at a reasonable cost, and a preliminary survey, to be made in connection with the work of improvement, was authorized.

This survey was made during the low-water period of 1903, and in his report of December 12, 1903, Captain Johnston expresses the opinion that the only way to insure a 3-foot depth all the year between Newbern and Goldsboro is by means of locks and dams, but that the existing commerce is not sufficient to justify the cost of such canalization of the river. He believes, however, that a decided improvement could be effected by a judicious further application of dredging and regulation works in the open channel, and that the river is worthy of such additional improvement. He estimates that $40,000 a year for two years could be profitably expended in securing the work already done and in additional works.

In forwarding this survey report the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers, expresses a doubt as to the propriety of any further improvement of the river between Goldsboro and Kinston (respectively 94 and 50 miles above Newbern), and says that probably the requirements of the river below Kinston might be fully met by an annual appropriation of $10,000 for four or five years for the purpose of restoring old dikes, removing snags, etc.

These reports have been referred for consideration of the Board of Engineers for Rivers and Harbors, as required by sections 3 and 14 of the said act of June 13, 1902, and attention is respectfully invited to the Board's final report of March 14, 1904, in seventh indorsement thereon.

In view of the data before it, the Board presents the following conclusions:

> The improvement of the river between Newbern and Kinston by open-channel works to secure a 3-foot channel is practicable, but the cost of such improvement is too great to be justified by the resulting benefits.
>
> The improvement of the river between Kinston and Goldsboro to secure a 3-foot channel is practicable only by canalization, and at a cost wholly incommensurate with the resulting benefits.

The Board is therefore of the opinion that it is not advisable for the United States to undertake the improvement of the "Neuse River, from Goldsboro to Newbern, with a view to securing a depth of 3 feet."

I concur in the opinion of the Board.

In connection with this investigation, however, consideration has incidentally been given by the Board to the question of improving

Neuse River below Newbern, and on this point it submits the following conclusions:

> The improvement of the river below Newbern by dredging to secure a channel 8 feet deep at dead low water is practicable at an estimated cost of about $14,000, which is amply justified by the resulting benefits to commerce.
>
> The channel below Newbern can be maintained, and the commerce above Newbern materially aided, by dredging and snagging and the occasional use of temporary expedients, at an annual estimated cost of $6,000, which is justified by the resulting benefits.

To carry out this modified project for Neuse River, which is recommended by the Board, an initial appropriation of $20,000 is needed and $6,000 annually thereafter for maintenance.

Very respectfully, your obedient servant,

A. Mackenzie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Wm. H. Taft,
Secretary of War.

PRELIMINARY EXAMINATION OF NEUSE RIVER, NORTH CAROLINA, FROM GOLDSBORO TO NEWBERN.

United States Engineer Office,
Wilmington, N. C., August 22, 1902.

General: In compliance with instructions contained in letter from your office, dated June 23, 1902, I have the honor to submit the following preliminary report on "Neuse River, from Goldsboro to Newbern, with a view to securing a depth of three feet."

No preliminary examination was made, the data necessary for this report being already on file.

Neuse River rises in central North Carolina and flows in a southeasterly direction into Pamlico Sound. Goldsboro and Newbern are respectively 134 and 40 miles above its mouth, the part under present consideration being 94 miles long.

The river has been under improvement by the Government since 1878, a total of $306,500 having been appropriated and spent in dredging and removing war obstructions near Newbern, in clearing the stream of snags, logs, etc., as far as Smithfield, 56 miles above Goldsboro, and in contracting the stream between Newbern and Kinston by the construction of over 50,000 feet of spur jetties. Between 1878 and 1892 the expenditures averaged nearly $19,000 annually, and progress was comparatively rapid, the low-water depth being reported in 1891 as 3 feet in the 50 miles from Newbern to Kinston, but since 1892 appropriations have been much smaller and the expenditures have averaged less than $5,000 annually, nearly all of which has been needed for keeping the channel free from snags, sunken logs, etc. There has been a consequent deterioration in the jetty system for lack of maintenance, which, together with the lowering of the low-water level following the shrinkage in volume of the stream during dry seasons (a result of the cutting away of forests), has resulted in a reduction to 1 foot of the governing depth to Kinston.

The project of 1878 included obtaining a 4-foot low-water depth to Kinston, and in 1891, when the governing depth was reported as 3 feet, the additional cost of increasing to 4 feet was estimated at $25,000 to $30,000. Although it has since decreased to 1 foot, there is still a 4-foot low-water channel to Biddles Landing, 27½ miles above Newbern, leaving only 22½ miles below Kinston over which the governing depth is less than the desired 3 feet. The fall in the river during low-water stage in these 22½ miles is 13 feet.

No work other than clearing has been done in the 44 miles between Kinston and Goldsboro, and there are no data available as to slope, which is probably greater than below Kinston. There is hardly less than 50 feet fall in the 66½ miles of river requiring improvement in order to obtain a depth of 3 feet to Goldsboro.

The commerce on the river above Newbern was 66,000 tons in 1901, and consisted principally of timber, cotton, fertilizers, and general merchandise. It was carried on 8 steamers drawing from 1½ to 4 feet, 1 of which ascended as far as Goldsboro and 3 as far as Whitehall, 74 miles above Newbern. The Goldsboro steamer has been laid up since May, not for lack of water, but because freight was not offered in paying quantities. It is probable that the amount of freight offered is materially affected by the uncertainty as to trips.

With the data available it can not be stated with certainty just what means must be employed to accomplish the desired improvement. It may be possible to obtain 3 feet depth to Kinston under the present jettying and dredging project, but above Kinston canalization would probably be necessary, the cost of which would probably not be warranted by the amount of commerce affected. These questions can be determined with certainty only after a survey, estimated to cost $500, and in view of the commerce interested and the large amount already expended on the river such a survey is respectfully recommended.

There is an available balance of about $13,000 to the credit of this improvement.

Very respectfully,

E. W. VAN C. LUCAS,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 25, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

The district engineer recommends that a survey be made to determine the advisability of the improvement of the river. Section 14 of the law of June 13, 1902, however, requires that the advisability of the improvement must be determined before a survey can be made.

I am of the opinion that the river is worthy of improvement if an improvement can be made at reasonable cost. Judging by the report of the district engineer, I presume that is his opinion also.

I recommend that the survey be made.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 29, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for examination and review.

* * * * * * *

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 18, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

1. The within and the accompanying reports on preliminary examination and survey of "Neuse River, from Goldsboro to Newbern, with a view to securing a depth of three feet," and the indorsements of the division engineer have been examined and reviewed by the Board of Engineers for Rivers and Harbors.

2. This river has been under improvement by the United States since 1878. The present approved project "is to clear the river of obstructions and obtain 8 feet depth to Newbern, 4 feet to Kinston, and 3 feet during nine months of the year to Smithfield." Kinston, Goldsboro, and Smithfield are, respectively, 50, 94, and 150 miles above Newbern. The whole reach under consideration is therefore covered by the existing approved project under which a total of $313,215.30 has been expended.

3. Under the sufficient appropriations made up to 1892 satisfactory results, principally in the lower part of the river, were obtained, but since 1892 the funds provided have been less than the estimated cost of maintenance, and much of the work has deteriorated.

4. An examination of the low-water profile accompanying the report of the district officer discloses the fact that between Kinston and Goldsboro there are 23 shoals 1 foot or less in depth, and 168 shoals 2 feet or less, while between Kingston and Newbern there are but 2 points 1 foot or less in depth, and 26 points 2 feet or less. The fall in the reach between Waynesboro Landing (the landing near Goldsboro) and Kinston—48¾ miles—is reported to be 34.4 feet, or about 0.7 foot per mile, and the fall for the 31¾ miles next below Kinston is 13.3 feet, or about 0.4 foot per mile. Below this reach the slope is practically nil. The low-water discharge is reported to be about 250 to 350 cubic feet per second near Waynesboro Landing and about 650 cubic feet per second near the mouth of Contentnia Creek. Under these conditions of slope and discharge the only way to insure a depth of 3 feet in the reach between Kinston and Goldsboro is by means of locks and dams. It appears possible to secure a depth of 3 to 4 feet below Kinston by regulation.

5. The district officer submits an estimate for a slack-water system covering the whole reach from Newbern to Waynesboro Landing. It

is stated that owing to lack of sufficient data this estimate is not complete, but that it is thought to be sufficiently accurate and large enough to cover any probable contingency. On the basis of this estimate it would cost at least $800,000 to carry slack water from Kinston to Goldsboro. The resulting benefits from such an improvement would, in the opinion of the Board, be entirely incommensurate with the cost.

6. The commerce on Neuse River above Newbern is reported for 1901 at 66,000 tons, and for 1902 at 113,328 tons, valued at $3,400,000. It is stated that a very small portion of this commerce reached Goldsboro and a comparatively small portion reached Kinston. The principal items of commerce are lumber, timber, general merchandise, fertilizer, cotton, and other farm products.

7. In view of what precedes, the Board can not recommend as at present desirable the improvement of "Neuse River, from Goldsboro to Newbern, with a view to securing a depth of three feet," but is of opinion that it is desirable to continue the improvement under the existing project from Kinston to the mouth. The Board recommends that the district officer be directed to prepare a project and estimate for the open-channel improvement and for maintenance of Neuse River between Kinston and the mouth, the channel depths to be as contemplated in the existing project. It is desirable that in the estimate separate items be made of the portions of river above and below Newbern.

For the Board:

A. M. Miller,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

[Fourth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, January 23, 1904.

Respectfully referred to Capt. R. P. Johnston, Corps of Engineers, with request that he prepare and submit the project and estimate as recommended by the Board of Engineers for Rivers and Harbors in paragraph 7 of the preceding indorsement.

* * * * * * *

By command of Brig. Gen. Gillespie:

H. F. Hodges,
Major, Corps of Engineers.

[Fifth indorsement.]

U. S. Engineer Office,
Wilmington, N. C., February 27, 1904.

Respectfully returned to the Chief of Engineers, United States Army, the estimates called for being, in general terms, as follows:

(*a*) Completing improvement below Newbern, 47,000 cubic yards of dredging, at 30 cents	$14,100
(*b*) Maintenance of projected channel below Newbern, annually	1,500

(*c*) Improvement Newbern to Kinston, including cost of necessary plant:	
Repairing existing jetties by replacing 17,000 linear feet, at $2.50 per foot	$42,500
Constructing 16,000 linear feet of new and more permanent jetties and training walls, at $4	64,000
Dredging, snagging, etc	10,000
Surveys and contingencies	8,500
Total	125,000
(*d*) Maintenance of channel, Newbern to Kinston, repairs to permanent work, dredging and snagging, annually	6,500

R. P. Johnston,
Captain, Corps of Engineers.

(Through the Division Engineer.)

[Sixth indorsement.]

Office of Division Engineer, Southeast Division,
Savannah, Ga., February 29, 1904.

Respectfully submitted to the Chief of Engineers, United States Army.

The river and harbor act of June 13, 1902, section 14, does not make provision for a report upon the improvement of the Neuse River below Newbern, but only from Goldsboro to Newbern.

The completion of the improvement below Newbern is considered to be of sufficient importance to justify the expenditure of the $15,600 required for the improvement and maintenance of that portion of the river.

Above Newbern, to Kinston, there seems to be an amount of money required for the improvement of the river by means of repairing jetties and the construction of new jetties and training walls much beyond that which would be justified by the character of the commerce to be benefited. It is believed that an appropriation of about $10,000 per year for a number of years for dredging and repairs to jetties would bring about a satisfactory condition of navigation in this portion of the river, and this amount is respectfully recommended for favorable consideration.

James B. Quinn,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Seventh indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., March 14, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

In addition to the within report and the indorsements thereon the Board of Engineers for Rivers and Harbors has carefully reviewed the accompanying report of the district officer, dated December 12, 1903, on a project and estimate of cost for open-channel improvement of the Neuse River, North Carolina, from Kinston to its mouth, and the indorsement upon the same.

The wording of the act calling for the reports under consideration is as follows: "Neuse River, from Goldsboro to Newbern, with a view to securing a depth of 3 feet." In third indorsement hereon the Board expressed the opinion that the only way to insure a depth of

3 feet in the reach between Kinston and Goldsboro is by means of locks and dams, and the cost of such work would not be justified by the amount of commerce to be benefited, but it appears possible to secure a depth of 3 to 4 feet below Kinston by regulation. It therefore recommended that the district officer prepare a project and estimate for the open-channel improvement and maintenance of Neuse River between Kinston and the mouth to secure the depths proposed in the present approved project, viz, 8 feet at dead low water from the mouth to Newbern and 4 feet from Newbern to Kinston.

This estimate is given in the fifth indorsement of February 27, 1904, and is as follows:

(*a*) Completing improvement below Newbern by dredging	$14,100
(*b*) Maintenance of channel below Newbern, annually	1,500
(*c*) Improvement from Newbern to Kinston:	
Repairs to existing works	42,500
Constructing new works	64,000
Dredging and snagging	10,000
Surveys and contingencies	8,500
Total	125,000
(*d*) Maintenance of channel, Newbern to Kinston, annually	6,500

The division engineer expresses the opinion that the improvement below Newbern in considered of sufficient importance to justify the cost thereof as estimated by the district officer, but the amount required for the improvement above Newbern is beyond that which would be justified by the character of the commerce to be benefited. He expresses the belief that an appropriation of about $10,000 per year for a number of years for dredging and repairs to jetties would be sufficient to bring about a satisfactory condition of navigation, and this amount is recommended by him.

The Board is not informed as to the exact distribution at different localities along the river of the expenditures that have been made, but it appears from the accompanying papers and the Annual Reports of the Chief of Engineers that the funds have been applied mainly in the upper portion of the section between Newbern and Kinston, where less than 3 feet now exists at low water, there being 4 feet in the lower portion. Appropriations averaging about $40,000 per annum from 1878 to 1882, mainly applied to jetties and other open channel works in this section, were sufficient to provide a 3-foot channel. Appropriations averaging about $8,400 annually, from 1883 to 1893, similarly applied, were insufficient to maintain a 3-foot channel at low water during the latter part of this time.

The main bulk of the commerce on the river is from Newbern to the mouth, and only a small portion of that above Newbern extends as far as Kinston. The river is practically paralleled on both sides by railroads.

In view of the data before the Board it concludes as follows:

(*a*) The improvement of the river below Newbern by dredging to secure a channel 8 feet deep at dead low water is practicable at an estimated cost of about $14,000, which is amply justified by the resulting benefits to commerce.

(*b*) The improvement of the river between Newbern and Kinston by open-channel works to secure a 3-foot channel is practicable, but the cost of such improvement is too great to be justified by the resulting benefits.

(*c*) The improvement of the river between Kinston and Goldsboro to secure a 3-foot channel is practicable only by canalization, and at a cost wholly incommensurate with the resulting benefits.

(*d*) The channel below Newbern can be maintained, and the commerce above Newbern materially aided, by dredging and snagging and the occasional use of temporary expedients, at an annual estimated cost of $6,000, which is justified by the resulting benefits.

The Board is therefore of the opinion that it is not advisable for the United States to undertake the improvement of the "Neuse River, from Goldsboro to Newbern, with a view to securing a depth of 3 feet," and recommends that the project for the Neuse River be modified to provide only for dredging and snagging, with the occasional use of temporary expedients, to secure a channel 8 feet deep at dead low water below Newbern, and to improve the channel above Newbern, as the interests of commerce may demand, to such extent as the funds appropriated will permit.

To carry out the modified project an initial appropriation of $20,000 is needed, and $6,000 annually thereafter for maintenance.

For the Board:

A. M. MILLER,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

SURVEY OF NEUSE RIVER, NORTH CAROLINA, FROM GOLDSBORO TO NEWBERN.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., December 12, 1903.

GENERAL: I have the honor to submit the following report of a recent survey of the "Neuse River, from Goldsboro to Newbern, with a view to securing a depth of three feet," which survey was made by authority of the Chief of Engineers, upon recommendation contained in preliminary report of August 22, 1902, submitted by Capt. E. W. Van C. Lucas, Corps of Engineers, pursuant to the requirements of section 14 of the act of Congress of June 13, 1902.

Attention is respectfully invited to the above-named preliminary report.

The survey was made in September, 1903, having been delayed until that time in order to take advantage of the lowest obtainable stage of the water. The data on hand are not sufficient to determine precisely the extreme low-water stage, but it is thought, from statements made to the survey party by persons well acquainted with the river, that the water rarely, if ever, gets lower than at the time of the survey. The water surface at that time may therefore be assumed as "extreme low water."

The results of the survey are plotted on 15 sheets,[a] tracings of which are forwarded herewith. These sheets are:

Profile of extreme low-water surface and the bottom of channel from Waynesboro Landing down to the twenty-seventh milepost above Newbern, in 14 sheets, numbered 1 to 14, inclusive.

Profile of extreme low-water surface and gauge sheet, from Waynesboro Landing to Newbern, in 1 sheet, numbered 15.

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[a] Not printed.

The difference in level between the extreme low-water surface at Waynesboro Landing [the landing near Goldsboro] and the mean low water at Newbern was found to be 47.765 feet. Of this total fall, 34.414 feet is in the 48¾ miles between Waynesboro Landing and Kinston, the average fall over this distance being 0.706 feet per mile, or, in round numbers, 1 in 7,500.

The remaining fall, 13.351 feet, is taken up in the 31¾ miles next below Kinston, the average fall over this distance being 0.420 feet per mile, or, in round numbers, 1 in 12,600.

In the remaining 18 miles next above Newbern there is practically no fall.

The extreme low-water discharge per second of the river, as determined by the hasty methods which the survey party found it necessary to employ, is:

	Cubic feet.
At Waynesboro Landing	363.6
At the seventy-fifth milepost	237.9
At Kinston	416.9
Immediately above the mouth of Cententnia Creek, which is the principal tributary of the Neuse	651.3

The discharge below the mouth of the Contentnia was not measured. It is hardly probable that the decrease between Waynesboro Landing and the seventy-fifth milepost can all be accounted for by evaporation and soakage, and hence an error in one or both measurements is suspected.

The present approved project "is to clear the river of obstructions and obtain 8 feet depth to Newbern, 4 feet (thence 50 miles) to Kinston, and 3 feet during nine months of the year to Smithfield," which is 150 miles above Newbern and 52 miles above Goldsboro.

From 1878 to 1882, inclusive, the appropriations ($190,000) averaged nearly $40,000 annually, and progress was reported as rapid and satisfactory.

From 1883 to 1893, inclusive, the appropriations ($92,500) averaged about $8,400 per year, which was still sufficient to secure some progress.

From 1894 to 1903, inclusive, the appropriations ($37,500) have averaged only $3,750 per year, which is less than the estimated cost of maintenance.

The jetties built to contract the channel and increase its depth have therefore deteriorated and many of them have entirely disappeared. Others have been broken and flanked to such an extent as now to effect injury instead of benefit, while still others remain intact and are serving their purpose. The stream between Kinston and Goldsboro has not been kept free from snags, and these are not only obstructions in themselves, but have also in many places produced shoals.

In addition to the above disadvantages, the low-water discharge of the river is now much smaller than formerly, due probably to the fact that the cutting of forests, clearing of fields, and ditching of lowlands permits the water to escape more rapidly than before.

The result of these combined influences is that the condition of the stream is reported to be actually worse in many places now than it was before improvement was undertaken.

From a personal inspection of the river, October 9 and December 8 and 9, 1903, I am convinced, however, that this deterioration is due to the causes above ascribed and not to any characteristics of the stream which might render it incapable of improvement. On the contrary, I believe the river is in most places well adapted in slope, discharge, and nature of banks and bed to improvement, either by regulation or canalization, although, of course, the amount of improvement possible by regulation is less certain and more limited than by locks and dams.

It is presumed that the act of June 13, 1902, under which this recent survey was made, contemplates between Newbern and Goldsboro a depth of 3 feet not merely during nine months of the year, as contemplated in the existing project, but throughout the entire year, so that vessels of 3-feet draft could have uninterrupted navigation.

In view of the small discharge of the river during low water, its present small depth, the instability of a considerable portion of its banks, the frequency with which logs, trees, and stumps are swept into the stream by flood waters, and the incomplete results obtained by past expenditures, it is thought that the only way to insure this result is by means of locks and dams, and the detailed estimate submitted below is, therefore, for improvement by that method; but it is my opinion that decided improvement could be effected by a judicious further application of training dikes, spur jetties, dredging, snagging, and bank protection, and the cost and maintenance of the latter would be far less than the cost, operation, and maintenance of locks and dams.

Almost as much snagging and bank protection would be necessary with locks and dams as in regulation, for, although there would then be slack water at low stages, the dams must be lowered at high stages and the current would then erode the banks and bring in trees, logs, and stumps to practically the same extent as if the dams had not been constructed.

Unfortunately the recent survey, being limited as to cost, did not develop all the information necessary to a complete and satisfactory estimate of the cost of improvement by either method. The heights of banks were not noted, the lengths of those portions that it will be necessary to protect were not measured, and the acreage of land along the river that may be permanently overflowed by canalization was not ascertained; but the personal inspection above referred to gave enough supplemental information to enable the preparation of an estimate which is thought to be sufficiently accurate and large enough to cover any probable contingencies.

This estimate contemplates a lock and dam of 8 feet lift (4 to 12) about 34 miles above Newbern, one of 6.5 feet lift (12 to 18.5) about 44 miles above Newbern or 6 miles below Kinston, one of 4 feet lift (18.5 to 22.5) between the fifty-fourth and fifty-fifth miles (from 4 to 5 miles above Kinston), one of 6.5 feet lift (22.5 to 29) near the sixty-second mile, one of 9½ feet lift (29 to 38.5) between the sixty-eighth and sixty-ninth miles, and one of 10 feet lift (38.5 to 48.5) near the eighty-first mile. The desired depth up to the lowest lock is to be obtained by dredging and jettying.

The number, locations, and lifts of the locks being based upon information, part of which was obtained only by a hasty reconnaissance, so to speak, could not, of course, be taken as final. It is not improbable that a careful study, based upon more complete data, would show that, by permitting part of the low lands bordering the river to be permanently inundated, one, or possibly two, of these locks and dams could be omitted. In this case the remaining locks and dams would be spaced farther apart, and would have a greater lift. The low lands near the river are now inundated at high water and are, therefore, valuable only for their timber, and this timber could be removed before the dams could be built. But on account of the uncertainty as to the amount and value of such land the intention has been to include enough locks and dams to avoid the necessity of overflowing any of the immediate banks.

Estimate.

	Concrete locks.	Timber locks.
Snagging river from Kinston to Goldsboro, about 50 miles, at $60 per mile	$3,000	$3,000
Dredging and repairing jetties below the lower lock and protecting caving banks	75,000	75,000
Land for lock sites, and such "low lands" as might be inundated	25,000	25,000
6 locks, 175 by 30 feet	750,000	270,000
6 movable dams, average length 200 feet each, at $50,000	300,000	300,000
6 lock keepers' houses, at $2,500	15,000	15,000
	1,168,000	688,000
Superintendence and contingencies, about 10 per cent	117,000	69,000
Total	1,285,000	757,000

Owing to the great difference between the cost of masonry locks and timber locks it is thought that the latter should be used on this stream if canalization be adopted. On account of the tortuous course of the river the locks could, without much additional expense, be placed in cut-offs excavated for the purpose, and could thus be entirely protected from the flood waters and in a measure protected from external water pressure.

The commerce carried on the Neuse River above Newbern during the year 1902 amounted to 113,328 tons, valued at $3,400,000. It consisted chiefly of lumber, timber, general merchandise, fertilizers, and farm products. Only a very small portion of this commerce went as far up as Goldsboro, and but a comparatively small portion as far as Kinston, for navigation on that portion of the stream was so extremely uncertain that merchants preferred the higher rates by rail to the delays by water. Hence the above statistics should not be regarded as any index to the commerce that would be carried if more certain navigation were provided.

Goldsboro and Kinston are both thriving towns of growing commercial and manufacturing importance, and the Neuse River, throughout nearly all of its course, traverses a fertile country, the development of which would doubtless be promoted and its production greatly increased if better transportation facilities were afforded.

It is not thought, however, that the commerce is now sufficient to justify the cost of canalization, even if timber locks should be adopted. But, as previously stated, I believe much improvement can be effected by regulation at a cost far less than that of canalization, and the river is thought worthy of such improvement.

To secure the value of the work already done, and to further the improvement, it is estimated that $40,000 per year can be profitably expended for this purpose during the next two years in repairing the jetties already constructed, constructing additional jetties, or training dikes at the worst shoals, supplementing the effect of the jetties by dredging where necessary, clearing the stream from Newbern to Goldsboro of snags and logs, and protecting those portions of the bank that are suffering most from erosion. The repairs to existing jetties should not be deferred since each year's neglect will greatly increase the total cost of repairs.

Owing to the broken character of the work, the liability to frequent interruption by high water, and the fact that the United States has most of the necessary plant on hand, while no contractors in this section are suitably equipped, the work should be done by hired labor with Government plant, material being purchased by advertisement or in open market, as may be more economical.

Very respectfully, your obedient servant,

R. P. JOHNSTON,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE OF DIVISION ENGINEER, SOUTHEAST DIVISION,
Savannah, Ga., December 16, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

It is admitted that the results of the survey are so unsatisfactory as to render estimates but mere approximations. If the estimates as given are entitled to any consideration, the idea of improving the river by a system of locks and dams might as well be abandoned. If Waynesboro Landing and Goldsboro are identical and the profiles give the depths of water in the navigable channel at low water, there is hardly sufficient water between Goldsboro and Kinston to float a skiff, and no doubt there is very little commerce between Kinston and Goldsboro, but there seems to be some argument for the improvement of the river below Kinston. Probably the requirements for this stretch of the river might be fully met by an annual appropriation of $10,000 for four or five years for the purpose of restoring old dikes, the removal of snags, etc.

I concur in the opinion of the district engineer that the results of the survey are unsatisfactory.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

M 19.

PRELIMINARY EXAMINATION OF NEW RIVER, NORTH CAROLINA.

[Printed in House Doc. No. 239, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 2, 1903.

SIR: I have the honor to submit herewith report, dated August 2, 1902, by Capt. E. W. Van C. Lucas, Corps of Engineers, and report supplementary thereto, dated June 11, 1903, by his successor, Capt. E. Eveleth Winslow, Corps of Engineers, on preliminary examination of New River, North Carolina, ordered by the river and harbor act of June 13, 1902.

This stream has been improved by the United States under a project for securing a channel 4 feet deep through Wrights Island and around Cedar Bush Marsh. Captain Winslow submits in his report an estimate amounting to $10,500 for the further improvement of the locality. He believes, however, that it is not worthy of an extensive improvement, but that it would be expedient to expend the balance remaining to the credit of this improvement, viz, about $3,200, in rebuilding the dike at Cedar Bush Marsh for the purpose of restoring and maintaining the channel previously obtained, and his views are concurred in by Lieut. Col. James B. Quinn, Corps of Engineers, the division engineer.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors, under the provisions of sections 3 and 14 of the above-mentioned act, and the Board states in its report of July 27, 1903, that it is desirable for the United States to expend the balance of the funds now available for this work, or as much thereof as may be necessary, in rebuilding the dike to restore the channel created under the present project, in the manner recommended by the district officer, but that no further expenditure and no extension of the project are at present desirable.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. E. W. VAN C. LUCAS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., August 2, 1902.

GENERAL: In compliance with instructions contained in letter from your office, dated June 23, 1902, I have the honor to submit the following preliminary report on New River, North Carolina:

No preliminary examination is necessary, there being on file sufficient data for a preliminary report.

New River flows in a southerly direction through Onslow County, N. C., and empties into the Atlantic Ocean through its own inlet about midway between Cape Lookout and Cape Fear. It has a total length of about 52 miles, and is navigable from its mouth about 23 miles to Jacksonville, where it is crossed by a branch of the Atlantic Coast Line Railroad, running from Wilmington to Newbern.

It has been under improvement since 1881, a total of $33,000 having been appropriated, of which nearly $30,000 has been expended under the projects of 1885 and 1894 to obtain a low-water depth of 4 to 5 feet, leaving a balance now on hand of about $3,000.

Under the project of 1885 cuts were made through Wrights Island and Cedar Bush Marsh, but on account of the shoaling in the marsh cut and the difficulty of keeping it open, the project of 1894 was adopted to secure the desired depth in the channel around the marsh by means of a pile training wall, which was completed in 1895, resulting in a satisfactory channel of nearly 5 feet depth, with promise of permanency as long as the dike lasted. The dike was not kept in repair, however, and the wooden sheet piling having since been totally destroyed by the teredo, the channel has reverted to its original condition, and the present governing depth over the inner shoals is only about 2 feet, with a tidal rise of about 1 foot. The low-water depth on the ocean bar varies between 3 and 6 feet, with a tidal rise of 3½ feet.

When the original project was adopted the river afforded the only outlet from the surrounding country, with the exception of about 50 miles of bad wagon roads in either direction to Wilmington and Newbern, respectively, but in 1891 the railroad began operating between Wilmington and Jacksonville and two years later was extended to Newbern, and there has been a consequent diminution in the commerce of this stream. The statistics for 1901 show a commerce of about 3,500 tons, consisting of naval stores, farm produce, and fish and oysters, carried in three small schooners to Wilmington. Before the railroad was constructed seven schooners were required for this commerce.

It is perhaps doubtful whether any further work on this stream is advisable at the present time, but this question can only be determined after a survey and estimate of cost of further improvements. Such a survey will cost about $100. I recommend that it be authorized, the expenses thereof to be paid from the balance on hand to the credit of the improvement.

Very respectfully,
E. W. Van C. Lucas,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. Engineer Office,
Baltimore, Md., August 8, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

This stream has been under improvement by the United States, but the district engineer reports that the commerce has deteriorated. In view of the decrease in commerce, I recommend that this report be returned to the district engineer with instructions to express his opinion whether the river is worthy of improvement by the United States.

Peter C. Hains,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
June 24, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 27, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on the preliminary examination of New River, North Carolina, the indorsement of the division engineer thereon, and other data available, including the report of the district officer on a survey of the locality made in connection with work under the present project.

New River has been under improvement since 1886. The commerce of the entrance, which is the portion of the river that has been under improvement, amounted to about 5,000 tons in 1902. In the opinion of the district officer and division engineer the funds in hand, about $3,200, are sufficient to rebuild, of oyster shells, the training dike in the channel around Cedar Bush Marsh, and that this work may be expected to produce and maintain a 4-foot channel along its length. The Board concurs in the opinion of the district officer and division engineer that it is desirable for the United States to expend the balance of funds now available for this work, or as much thereof as may be necessary, in restoring the channel created under the present project in the manner recommended by the district officer, but considers that no extension of the project is at present desirable. No further survey is deemed necessary.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

SUPPLEMENTARY REPORT ON PRELIMINARY EXAMINATION.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., June 11, 1903.

GENERAL: In compliance with instructions contained in the Department's letter of September 3, 1902, addressed to my predecessor in this office, Captain Lucas, I have the honor to submit a report upon the survey of New River, North Carolina.

New River empties into the Atlantic Ocean through New River Inlet, situated about midway between Cape Lookout and Cape Fear. It is navigable from its mouth about 23 miles to Jacksonville, where it is crossed by the railroad running between Wilmington and Newbern. The channel across the bar at the inlet is constantly shifting, the available depth varying from 3 to 6 feet at mean low water, with a tidal rise of about 3½ feet. This tidal oscillation decreases rapidly as you ascend the river, and at the upper end of the marshes amounts to less than a foot.

This river has been under improvement since 1886, a total of $33,000 having been appropriated and nearly $30,000 having been expended under the projects of 1885 and 1894, each of which aimed at producing a navigable channel of 4 feet depth. There is a remaining small balance pertaining to the improvement of about $3,200, and no existing project for the expenditure of this balance.

In its original unimproved condition this river had a navigable though crooked channel of 4 feet or more in depth, except for a series of shoals or oyster rooks aggregating about 7,000 feet in length. Under the project of 1885 cuts were dredged through Wrights Island, near the mouth, and Cedar Bush Marsh, farther inland. The former remained open and was actually scoured out by natural causes, but Cedar Bush Marsh cut showed a tendency to continuous shoaling at and near its extremities. For this reason there was adopted in 1894 a new project to secure the desired depth in a channel around this marsh, to be kept open by the influence of a pile training dike. This dike was completed in 1895, and was successful in keeping open a satisfactory channel until the dike itself was destroyed by the teredo. This dike was, when built, considered to a certain extent in the light of an experiment, and it was consequently constructed of timber only and no work of maintenance has since been done on it.

The present condition of the channel, as shown by the survey and the resulting map,[a] is as follows:

The Wrights Islands cut has scoured throughout its length and is in good condition.

The Cedar Bush Marsh cut proper has also scoured somewhat, but at and beyond its upper end considerable shoaling has taken place, so that this cut is no longer available.

The channel around Cedar Bush Marsh, to maintain which the dike was constructed, still exists, and there is a channel of the projected depth, but it is narrow and very tortuous, and its navigation in its present condition is difficult and dangerous.

Every vestige of the training dike has disappeared.

The estimated cost of work in this locality is as follows:

To dredge out the shoal at the upper end of the Cedar Bush Marsh cut to a depth of 4 feet and a width of 250 feet, 20,000 cubic yards, at 25 cents	$5,000
To restore the training dike of timber, 1,500 linear feet, at $2	3,000
To rebuild the dike of oyster shells, 25,000 bushels, at 10 cents	2,500

The dredging would give but temporary relief, the timber dike would not last over four years, but it is believed that the shell dike would accumulate oyster spawn and would in a short time be permanent; such has been the experience with shells in this vicinity.

Prior to the completion of the railroad in 1891 New River formed the only outlet for a large area of the surrounding country and its commerce was quite extensive. Since 1891 the commercial value of the river has been less, and during the calendar year 1902 there were in operation on New River 3 schooners of 4 feet draft, 2 naphtha launches of lighter draft, and about a dozen small sharpies. The present existing channel is therefore of sufficient depth for the vessels using it, but is so narrow and crooked as to be dangerous.

The commerce carried consisted of—

	Tons.[b]
Cotton	90
Cotton seed	175
Fish	1,000
Oysters	600
Clams	125
Ship stores	650
Lumber	1,600
Fertilizers	300
General merchandise	700
Total	5,240

Value estimated at $180,000.

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[a] Not printed.

[b] Quantities are approximate.

On account of the small commercial importance of this river it is not believed that it is worthy of an extensive improvement; but it is thought that it would be expedient to expend the balance remaining to the credit of its improvement in rebuilding the dike, using oyster shells for that purpose, and with the intention of restoring and maintaining the channel previously obtained.

It is not believed that this improvement would have any direct bearing upon the inland waterway through Bogue Sound between Beaufort Harbor and New River, as this waterway would probably enter New River to the north and east of the Cedar Bush Marsh, and vessels passing through it would not have to pass through the part of New River which has been under improvement.

Very respectfully,

E. EVELETH WINSLOW,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Savannah, Ga., June 13, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

The commercial importance of the river appears to be insufficient to warrant further improvement beyond the amount named by Captain Winslow. I concur in his conclusions.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division

APPENDIX N.

IMPROVEMENT OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA, AND OF CERTAIN RIVERS AND HARBORS IN SOUTH CAROLINA.

REPORT OF CAPT. G. P. HOWELL, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Waccamaw River, North Carolina and South Carolina, and Little Pedee River, South Carolina.
2. Great Pedee River, South Carolina.
3. Winyah Bay, South Carolina.
4. Santee, Wateree, and Congaree rivers, South Carolina.
5. Congaree River, South Carolina, from Gervais Street Bridge, Columbia, to Granby.
6. Inland waterways between Charleston Harbor, South Carolina, and opposite McClellanville.
7. Harbor at Charleston, South Carolina.
8. Wappoo cut, South Carolina.
9. Inland waterway between Charleston and Beaufort, South Carolina.
10. Beaufort River, South Carolina.
11. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS AND SURVEY.

12. Beaufort River, South Carolina.
13. Black River, South Carolina.
14. Charleston Harbor, South Carolina.
15. Edisto River, South Corolina.
16. Georgetown Harbor, South Carolina, including Sampit River and ocean entrance to Winyah Bay.
17. Port Royal bar, South Carolina.
18. Waccamaw River, South Carolina.
19. Wateree River, South Carolina.

United States Engineer Office,
Charleston, S. C., July 21, 1904.

General: I have the honor to transmit herewith my annual reports for the fiscal year ending June 30, 1904, for the works of improvement of rivers and harbors in this district.

Very respectfully,

G. P. Howell,
Captain, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

N 1.

IMPROVEMENT OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA, AND LITTLE PEDEE RIVER, SOUTH CAROLINA.

(A) WACCAMAW RIVER.

Snagging operations were carried on from the beginning of the fiscal year to November, 1903, when work was suspended on account of exhaustion of funds. The self-propelling snag boat removed from the banks and the channel, between points 16 miles above and 72 miles above the mouth, 1,638 obstructions at a cost of $1.07 per unit. The expenditure was $1,752.25. A hand force removed between points 74 miles and 105 miles above the mouth, 3,491 obstructions at an approximate cost of 39 cents per unit. The expenditure was $1,361.70.

One of the Government dredges (dredge *No. 1*) dredged at Grahamville shoal, about 60 miles above the mouth, and at Coxs shoal, about 24 miles above the mouth. A channel about 50 feet wide and 6 feet deep was made through these shoals which had before completely blocked navigation at low water. There were removed 15,732 cubic yards of material at an approximate cost of $15\frac{5}{8}$ cents per cubic yard. The expenditure was $2,425.72.

About 79 per cent of the approved project had been accomplished to June 30, 1904.

The survey authorized by the river and harbor act of June 13, 1902, was submitted to Congress in February, 1904, and published in House Executive Document No. 514, Fifty-eighth Congress, second session. The Board of Engineers for Rivers and Harbors recommended a channel 12 feet deep to Bucksville, 36 miles above the mouth, and 6 feet deep thence to Conway, a distance of 14 miles, at a cost of $50,000.

It is proposed to apply the available balance and additional appropriations recommended in maintaining the improvement and dredging the worst shoals below Conway.

Money statement.

July 1, 1903, balance unexpended		$7,477.55
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$2,344.65	
For maintenance of improvement	4,508.55	
		6,853.20
July 1, 1904, balance unexpended		624.35
Amount (estimated) required for completion of existing project		26,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$18,000.00	
For maintenance of improvement	6,000.00	
		24,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved June 14, 1880	$15,000	Approved July 13, 1892	$10,000
Approved March 3, 1881	10,000	Of August 18, 1894	6,000
Passed August 2, 1882	4,400	Of June 3, 1896	6,000
Approved July 5, 1884	6,000	Approved March 3, 1899	3,000
Approved August 5, 1886	15,000	Approved June 13, 1902	9,000
Of August 11, 1888	15,000		
Approved September 19, 1890	12,500	Total	111,900

Total expenditures, including June 30, 1904, $111,275.65.

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
OUTWARD FREIGHTS.	*Tons.*	
Naval stores	7,670	$175,000
Cotton	1,000	240,000
Timber, lumber, etc	120,000	540,000
Fish, game, and vegetables	600	60,000
Rice and flour	1,243	44,400
Miscellaneous	1,300	105,300
Total	131,813	1,164,700
INWARD FREIGHTS.		
Miscellaneous merchandise and fertilizers	12,000	720,000
Grand total	143,813	1,884,700

List of vessels plying Waccamaw River, South Carolina, during the calendar year 1903.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	*Feet.*	*Feet.*	
Gov. Safford	Side wheel steamer	129.6	26.0	7.5	307
Merchant	do	147.7	29.6	5.4	405
Ruth	do	81.0	26.0	4.0	89
F. G. Burroughs	do	125.0	22.0	6.0	283
William Elliot	do	101.1	31.0	6.0	171
Eutaw	do	156.0	29.8	7.8	547
Planter	do	155.0	32.8	9.1	499
Elmore A. Kent	Screw steamer	77.7	18.8	9.2	87
Wm. P. Congdon	do	75.2	18.0	7.8	68
E. T. Williams	do	81.0	21.0	9.0	97
Henry Lloyd	do	40.5	12.2	4.8	13
Fearless	do	58.0	11.0	4.0	18
Emma A. Twiggs	do	53.0	13.2	4.5	16
Pender	do	52.7	14.9	3.4	28
Bertie	do	49.5	9.8	3.5	16
Robert E. Lee	do	67.0	17.0	4.5	56
Louisa	Stem wheel steamer	101.0	25.0	5.0	280
Frank Sessoms	do	86.6	22.8	3.6	79
Myra W. Spear	Schooner	99.2	27.6	7.5	156
E. A. Danenhauer	do	116.6	30.2	7.4	228
Robt. McClintock	do	96.0	26.7	7.4	154
Bayard Hopkins	do	118.0	30.0	9.0	269
Wm. Linthicum	do	112.0	27.6	8.0	156
Chas. Linthicum	do	104.0	26.0	8.2	131
Venus	do	108.0	29.4	9.1	204
John Russell	do	66.2	22.2	4.7	36
Crescent	do	150.8	24.8	12.4	463
Edward L. Martin	do	87.2	23.6	6.8	84
Edgar C. Ross	do	144.2	34.3	10.0	399
Ruby & Bessie	do	105.8	28.9	8.7	138
Waccamaw	do	137.7	33.3	14.5	458
Willie	Yacht	40.0	9.0	4.0	[a]6
Madge	do	35.0	7.0	2.0	[a]3
Sprite	Yacht (nahptha)	37.0	8.0	3.0	[a]5
Leilah	Yacht	40.0	8.0	3.0	5
Pelican	do	30.0	7.0	2.5	3

[a] Approximate.

(B) LITTLE PEDEE RIVER.

During the year a hand force worked from deck lighter from December, 1903, to the end of March, 1904. Work was suspended on account of exhaustion of funds. Between the mouth of the river and Gallivant's bridge (47 miles above the mouth), the following obstructions were removed: 1,224 logs, 521 stumps, and 3,097 large snags from the channel, and 1,326 trees and 152¼ cords of brush from the banks, at a cost of about 20 cents per unit. The low cost is due to the fact that the materials removed were mostly from the surface, and could easily be handled by hand.

About 50 per cent of the approved project had been accomplished to June 30, 1904.

It is proposed to expend the available balance, and additional appropriation recommended, in snagging the stream, maintaining first the portion previously improved.

Money statement.

July 1, 1903, balance unexpended		$1,447.92
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		1,267.69
July 1, 1904, balance unexpended		180.23
Amount (estimated) required for completion of existing project		26,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$8,500.00	
For maintenance of improvement	3,500.00	
		12,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

For this improvement the following appropriations have been made:

By act of Congress—	
Of August 11, 1888	$5,000
Approved September 19, 1890	5,000
Approved July 13, 1892	5,000
Of August 18, 1894	4,000
Of June 3, 1896	$3,000
Approved June 13, 1902	1,500
Total	23,500

Total expenditures, including June 30, 1904, $23,319.77.

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
OUTWARD FREIGHTS.	*Tons.*	
Naval stores	300	$10,000
Cotton	200	48,000
Lumber, timber, and cord wood	75,000	450,000
Total	75,500	508,000
INWARD FREIGHTS.		
Miscellaneous	250	12,500
Fertilizers	2,000	40,000
Grand total	77,750	560,500

List of vessels plying Little Pedee River, South Carolina, during calendar year 1903.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	*Feet.*	*Feet.*	
Ruth	Side-wheel steamer	81.0	26.0	4.0	89
Almont	Yacht	40.0	8.0	5.0	4
Loretta	do	40.0	9.0	3.0	7
Willie	do	40.0	9.0	4.0	6
Pelican	do	30.0	7.0	2.5	3

N 2.

IMPROVEMENT OF GREAT PEDEE RIVER, SOUTH CAROLINA.

Snagging operations were carried on during the year by the self-propelling snag boats *Great Pedee* and *Little Pedee* between the mouth and a point 157 miles above the mouth; 4,400 obstructions were removed at an approximate cost of $1.97 per unit.

Proposals have been invited and bids received for the construction of a steel combination dredge and snag boat to be used primarily in carrying out the project for the improvement of the upper portion of the river (see page 245, Annual Report of the Chief of Engineers for 1903). It is expected that this boat will be at work during the coming fiscal year.

About 80 per cent of the old project had been completed up to June 30, 1904. Work on the new project has just begun.

It is proposed to spend the available balance and the funds appropriated in maintaining the general improvement and in obtaining the channel in the upper river, as provided for in the project.

Money statement.

July 1, 1903, balance unexpended		$60,546.44
Amount appropriated by sundry civil act approved April 28, 1904		10,000.00
		70,546.44
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$2,256.44	
For maintenance of improvement	6,512.62	
		8,769.06
July 1, 1904, balance unexpended		61,777.38
July 1, 1904, outstanding liabilities		488,32
July 1, 1904, balance available		61,289.06
July 1, 1904, amount covered by uncompleted contracts		2,750.00
Amount (estimated) required for completion of existing project		56,300.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$50,000.00	
For maintenance of improvement	5,000.00	
		55,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved June 14, 1880	$7,000	Of August 18, 1894	$6,000
Approved March 3, 1881	6,000	Passed June 3, 1896	12,000
Passed August 2, 1882	6,000	Approved March 3, 1899	4,000
Approved July 5, 1884	8,000	Approved June 13, 1902	22,500
Approved August 5, 1886	20,000	Approved March 3, 1903	40,000
Of August 11, 1888	20,000	Approved April 28, 1904	10,000
Approved September 19, 1890	12,500		
Approved July 13, 1892	10,000	Total	184,000

Total expenditures, including June 30, 1904, $122,222.62.

LIST OF CONTRACTS IN FORCE (EMERGENCY).

Name of contractor.	Contract for—	Price.	Date of—		
			Contract.	Beginning.	Expiration.
Merrill-Stevens Engineering Company	Dredge bucket	$600	Mar. 26, 1904	Mar. 31, 1904	June 11, 1904
Schoellhorn-Albrecht Machine Company	2 marine engines.	2,150	June 1, 1904	June 11, 1904	Aug. 10, 1904

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
OUTWARD FREIGHTS.	*Tons.*	
Naval stores	693	$27,553
Cotton	1,350	324,060
Lumber, timber, and cross-ties	140,000	494,397
Rice	1,451	51,847
Miscellaneous	520	20,902
Total	144,014	918,759
INWARD FREIGHTS.		
Miscellaneous merchandise and fertilizers	9,000	420,000
Grand total	153,014	1,338,759

List of vessels plying Great Pedee River, South Carolina, during calendar year, 1903.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	*Feet.*	*Feet.*	
Merchant	Side-wheel steamer	147.7	29.6	4.5	405
Louisa	Stern-wheel steamer	101.0	25.0	5.0	280
Frank Sessoms	do	86.6	22.8	3.6	79
Wm. P. Congdon	Screw steamer	75.2	18.0	7.8	68
Henry Lloyd	do	40.5	12.2	4.8	13
Fearless	do	58.0	11.0	4.0	18
Emma A. Twigs	do	53.0	13.2	4.5	16
Pender	do	52.7	14.9	3.4	28
Bertie	do	49.5	9.8	3.5	16
Robert E. Lee	do	67.0	17.0	4.5	56
Elmore A. Kent	do	77.7	18.8	9.2	87
Myra W. Spear	Schooner	99.2	27.6	7.5	156
E. A. Danenhauer	do	166.6	30.2	8.7	228
Robt. McClintock	do	96.0	26.7	7.4	154
Bayard Hopkins	do	118.0	30.0	9.0	269
Wm. Linthicum	do	112.0	27.6	8.0	156
Chas. Linthicum	do	104.0	26.4	8.2	131
Venus	do	108.0	29.4	9.1	204
John Russell	do	66.2	22.2	4.7	36
Crescent	do	150.8	34.8	12.4	463
Edward L. Martin	do	87.2	23.6	8.6	84
Edgar C. Ross	do	144.2	34.3	10.0	399
Ruby and Bessie	do	105.8	28.9	8.7	138
Waccamaw	do	137.7	33.3	14.5	458
Pelican	Steam yacht	30.0	7.0	2.5	3
Willie	do	40.0	9.0	4.0	6
Madge	do	35.0	7.0	2.0	3
Sprite	do	37.0	8.0	3.0	5
Leilah	do	40.0	8.0	3.0	5
Loretta	do	40.0	9.0	3.0	7
Maria C	do	35.0	10.0	4.5	8

N 3.

IMPROVEMENT OF WINYAH BAY, SOUTH CAROLINA.

The dredge *Winyah Bay* was returned to the district, and resumed work December 21, 1903. It removed 17,549 cubic yards of material from the entrance channels, and 188,432 cubic yards from the eastern channel in Upper Winyah Bay, aggregating 205,981 cubic yards at a cost of about 10$\frac{3}{5}$ cents per cubic yard. The total expenditure was $15,963.03. A survey of the entrance channel between the jetties shows that the project depth of 15 feet is maintained throughout, and that the channel is continually improving under the action of natural causes. The crests of the jetties have maintained their heights, but thus far there has been no severe strains to test them.

In the extension of the mud dike on South Island to its terminus in Pine Ridge 15,503 cubic yards of material were placed by hand force at a cost of 35 cents per cubic yard, and 8,391 cubic yards were placed by clam-shell dredge *No. 2* at a cost of 52 cents per cubic yard. Other work on the dike was sodding 10,236 square yards at an approximate cost of 26 cents per square yard, and building a dam across Sand Creek at an approximate cost of $1,000. The total expenditure was $13,500.

A new combination clam and dipper dredge has been elaborated out of the old dredge *Progress* at a cost of $8,194.59, and two bottom-dump lighters of 206 cubic yards capacity each have been built, to be used in dredging in the upper waters of Winyah Bay and in Sampit River, at a cost of $5,355.83. A contract has been made for extending the south jetty shoreward to a junction with the mud dike by means of a cofferdam dike. The amount of the contract is $24,860, and the work is to be completed within ten months from commencement.

The expenditures for general repairs to plant, surveys, and miscellaneous work amounted to $10,511.98.

About 83 per cent of the approved project has been completed to June 30, 1904.

The report of the survey ordered by the river and harbor act of June 13, 1902, on the subject of an 18-foot channel from Georgetown to the sea has been published in House Document No. 398, Fifty-eighth Congress, second session. The Board of Engineers for Rivers and Harbors recommended the improvement of the western channel in Winyah Bay. The cost of the entire project was estimated at $650,000.

It is proposed to expend the available balance and additional appropriation recommended in dredging in the entrance channel and at the shoal places between the entrance and the city of Georgetown; in the shoreward extension of the south jetty, and in the completion of the mud dike.

Money statement.

July 1, 1903, balance unexpended		$233, 273. 46
Received from auction sale		25. 00
Amount appropriated by sundry civil act approved April 28, 1904		70, 000. 00
		303, 298. 46
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$55, 820. 11	
For maintenance of improvement	300. 00	
		56, 120. 11
July 1, 1904, balance unexpended		247, 178. 35
July 1, 1904, outstanding liabilities		7, 043. 84
July 1, 1904, balance available		240, 134. 51
July 1, 1904, amount covered by uncompleted contracts		27, 415. 72
Amount (estimated) required for completion of existing project		147, 750. 00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$75, 000. 00	
For maintenance of improvement	15, 000. 00	
		90, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

Amount and date of all appropriations for this work are as follows:

By act of Congress—	
Approved August 5, 1886	$18, 750. 00
Of August 11, 1888	100, 000. 00
Approved September 19, 1890	100, 000. 00
Approved July 13, 1892	100, 000. 00
Of August 18, 1894	110, 000. 00
Passed June 3, 1896	20, 000. 00
Approved June 4, 1897	350, 000. 00
Approved July 1, 1898	450, 000. 00
Approved March 3, 1899	58, 500. 00
Approved June 6, 1900	285, 000. 00
Approved March 3, 1901	500, 000. 00
Approved June 28, 1902	35, 000. 00
Received on account of Treasury settlement No. 31207	33. 76
Approved March 3, 1903	100, 000. 00
Received on account of sales at auction, February 19, 1904	15. 00
Received on account of sales at auction, June 18, 1904	10. 00
Approved April 28, 1904	70, 000. 00
Total appropriations and receipts	2, 297, 308. 76

Total expenditures, including June 30, 1904, $2,050,130.41.

LIST OF CONTRACTS IN FORCE.

Name of contractor.	Constructing cofferdam dike (material in place).	Price per unit in place.	Date of approval.	Date of beginning.	Date of expiration.
Simons-Mayrant Co	285,000 feet B. M. lumber	$25. 00	June 24, 1904	June 28, 1904	Apr. 28, 1905
	680 guide piles	7. 00			
	22,500 cubic yards mud filling.	. 55			
	300 cords brush	2. 00			

EMERGENCY CONTRACTS.

Name of contractor.	Contract for—	Price.	Date of contract.	Date of beginning.	Date of expiration.
Thos. W. Brown	Bottom dump lighter	$700.00	Dec. 21, 1903	Jan. 14, 1904	Apr. 1, 1904
C. B. Colbert	Repairs to dredge	3,698.75	Dec. 28, 1903	Dec. 29, 1903	Mar. 28, 1904
W. C. Reaves	Bottom dump lighter	2,245.00	Jan. 12, 1904	Jan. 13, 1904	Mar. 10, 1904
Standard Fuel Supply Co.	About 1,000 tons of coal	3.53	May 31, 1904	June 10, 1904	July 1, 1904

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
OUTWARD FREIGHTS.	*Tons.*	
Naval stores	13,713	$314,510
Cotton and cotton seed	3,952	793,640
Rice	3,511	240,744
Lumber, timber, shingles, and ties	303,200	2,161,984
Fish, game, and vegetables	1,887	188,703
Miscellaneous	1,239	1,660,000
Total	327,502	5,359,581
INWARD FREIGHTS.		
Miscellaneous	41,000	4,000,000
Grand total	368,502	9,359,581

List of vessels plying Winyah Bay and entering port of Georgetown, S. C., calendar year 1903.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	*Feet.*	*Feet.*	
Waccamaw	Screw steamship	256.0	42.0	14.0	1,359
Georgetown	do	256.0	42.0	14.0	1,359
Navahoe	do	282.9	34.3	21.8	1,879
Katahdin	do	239.1	38.0	14.0	1,380
Richmond	do	206.0	33.0	21.6	1,437
Aragon	do	247.7	42.6	14.8	1,450
Farwell	do	212.3	35.6	19.6	1,200
Wm. P. Congdon	Screw steamer	72.2	18.2	7.8	68
Henry Lloyd	do	40.5	12.2	4.8	13
Fearless	do	58.0	11.0	4.0	18
Emma Twiggs	do	53.0	13.2	4.5	16
Pender	do	52.7	14.9	3.4	28
Bertie	do	49.5	9.8	3.5	16
E. T. Williams	do	81.0	21.0	9.0	97
Robert E. Lee	do	67.0	17.0	4.5	56
Mabel S	do	65.3	17.7	6.0	48
Two Brothers	Stern-wheel steamer	75.1	30.1	5.4	97
Louisa	do	101.0	25.0	5.0	280
Frank Sessoms	do	86.6	22.8	3.6	79
Merchant	Side-wheel steamer	147.7	29.6	5.4	405
Gov. Safford	do	129.6	26.0	7.5	307
Ruth	do	81.0	26.0	4.0	89
F. G. Burroughs	do	125.0	22.0	6.0	283
Wm. Elliot	do	101.0	31.0	6.0	171
Eutaw	do	156.0	29.8	7.8	547
Planter	do	155.0	32.8	9.1	499
Winyah	Schooner	43.2	16.4	6.1	18
We Go	do	44.0	13.7	4.3	18
Hugh	do	47.6	14.2	3.4	14
Waccamaw	do	137.7	33.5	14.5	458
Bayard Hopkins	do	118.0	30.0	9.0	269
Wm. Linthicum	do	112.0	27.6	8.0	156
Robt. McClintock	do	96.0	26.7	7.4	154
E. A. Danenhauer	do	116.6	30.2	8.7	228
Warren B. Potter	do	130.0	32.4	12.0	368
Chas. H. Sprague	do	122.0	30.7	9.5	318
Myra W. Spear	do	99.2	27.6	7.5	156
Edward L. Martin	do	87.2	23.6	6.8	84
Rebecca R. Douglass	do	138.8	33.9	9.5	475
Nellie Floyd	do	136.0	33.0	15.4	457
Percy & Lillie	do	99.2	27.6	7.5	156

List of vessels plying Winyah Bay and entering port of Georgetown, S. C., etc.—Continued.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	*Feet.*	*Feet.*	
Golden Ball	Schooner	124.2	30.3	10.5	286
Chas. Linthicum	do	104.0	26.4	8.2	131
J. A. Beckerman	do	140.7	34.2	16.1	485
Venus	do	108.0	29.4	9.1	204
Sarah D. J. Rawson	do	140.5	34.8	11.1	387
John T. Russell	do	66.2	22.2	4.7	36
William Churchill	do	143.6	34.7	11.0	432
Nathan Lawrence	do	168.4	35.2	15.1	770
William H. Bailey	do	146.6	34.6	15.1	489
Kate Darlington	do	97.8	28.0	7.1	135
Ruby & Bessie	do	105.0	28.9	8.7	138
John D. Paige	do	127.0	31.5	9.6	397
C. S. Tryon	do	97.6	26.0	7.0	125
Conception	Schooner (English)	(a)	(a)	(a)	349
Jessie Barlow	Schooner	120.6	30.4	11.1	262
William H. Davison	do	33.2	12.0	5.0	10
F. W. McCullough	do	99.4	28.0	8.0	165
Mary A. Fisher	do	95.5	26.9	6.6	116
William H. Skinner	do	129.2	30.2	9.0	262
J. W. Hutt	Schooner (English)	(a)	(a)	(a)	380
J. Howell Leeds	Schooner	134.5	34.8	11.5	414
City of Georgetown	do	168.7	36.4	12.6	599
S. E. Hall	do	147.8	35.0	11.0	384
General Johnson	do	141.5	35.0	12.6	390
H. G. Morse	do	147.6	34.4	10.8	437
Crescent	do	105.8	34.8	12.4	463
P. Satisfaction	do	154.5	35.0	12.5	524
James Rothwell	do	151.1	35.0	14.3	498
C. C. Lane	do	130.0	32.0	11.0	321
Norenbega	do	137.5	32.0	9.5	310
Fred Knowlton	do	128.7	33.5	11.1	317
B. L. Hazard	do	131.8	31.1	8.4	392
F. C. Pendleton	do	145.7	33.2	12.3	408
Ida C. Schoalcraft	do	134.3	32.6	9.6	320
E. C. Allen	do	144.2	34.6	15.1	499
Lottie R. Russell	do	122.8	32.6	9.9	304
John A. Curtis	do	111.2	23.6	8.5	155
Wm. P. Hood	do	158.4	36.4	16.9	665
Grace S. Eymore	do	166.0	34.2	16.0	633
Etta	Sloop	47.0	11.6	3.3	8
Clipper	do	31.0	11.0	2.9	10
Leila	do	31.0	10.0	2.5	8
Liza Jane	do	40.8	12.5	4.9	17
Willie	Yacht	40.0	9.0	4.0	[b] 6
Madge	do	35.0	7.0	2.0	[b] 3
Sprite	Yacht (naphtha)	37.0	8.0	3.0	[b] 5
Leilah	Yacht	40.0	8.0	3.0	[b] 5
Advance	do	25.0	5.5	1.5	[b] 2
Loretta	do	40.0	9.0	3.0	[b] 7
Husted	do	42.0	8.0	3.0	[b] 3
Syra	do	36.0	7.0	3.0	[b] 3
Thistle	do	43.6	11.5	3.9	[b] 13
Almont	do	40.0	8.0	5.0	[b] 4
Pelican	do	30.0	7.0	2.5	[b] 3
Maria C	do	35.0	10.0	4.5	[b] 8
Petrel	do	40.0	10.0	3.5	[b] 9
Saxon	Barge	(a)	(a)	(a)	....

a Dimensions unknown. b Approximate.

N 4.

IMPROVEMENT OF SANTEE, WATEREE, AND CONGAREE RIVERS, SOUTH CAROLINA.

(A) SANTEE RIVER.

During the year two Government dredges worked in the Esterville-Minim Creek Canal, dredging and removing obstructions, endeavoring to restore the channel to the condition previously brought about by the Government. The smaller dredge (dredge *No. 2*) worked principally at the Winyah Bay mouth of the canal, and about midway of the canal, dredging to 50 feet width and 6 feet depth at low water. There were removed 21,624 cubic yards of material and 443 obstructions, at an approximate cost of 7⅜ cents per cubic yard, including obstructions and cost of repairs. The expenditure was $1,628.31.

Dredge *No. 1*, which was originally used in making the canal, received extensive repairs and removed, principally at the Winyah Bay mouth, 41,571 cubic yards of material and 17 obstructions, at an approximate cost of 13⅖ cents per cubic yard, including the cost of repairs. The high rate is due to the repairs, which will not again be required for some time. The expenditure was $5,577.67.

The self-propelling snagboat *Great Pedee* removed from the Santee River 571 obstructions, between points 21 and 141 miles above the mouth, at a cost of $2.32 per unit.

About 83 per cent of the approved project has been completed up to June 30, 1904.

It is proposed to apply the available balance and additional appropriations recommended in widening and deepening the Esterville-Minim Creek Canal in accordance with the project, and in keeping the Santee River proper clear of snags.

Money statement.

July 1, 1903, balance unexpended		$10,814.68
Received from auction sale		13.00
Amount allotted from appropriation, act of June 13, 1902		7,000.00
		17,827.68
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		9,378.54
July 1, 1904, balance unexpended		8,449.14
Amount (estimated) required for completion of existing project		167,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$40,000.00	
For maintenance of improvement	15,000.00	
		55,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

For this improvement the following appropriations have been made:

By act of Congress—	
Approved March 3, 1881	$22,000
Passed August 3, 1882	20,000
Approved July 15, 1884	15,000
Approved August 5, 1886	18,750
Of August 11, 1888	24,000
Approved September 19, 1890	30,000
Approved July 13, 1892	30,000
Of August 18, 1894	40,000
By act of Congress—	
Passed June 3, 1896	$48,000
Approved March 3, 1899	20,000
Approved June 13, 1902	15,000
Approved June 13, 1902	7,000
Account of sales at auction	13
Total	289,763

The total expenditures, including June 30, 1904, is $281,313.86.

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
OUTWARD FREIGHTS.	*Tons.*	
Naval stores	21,000	$370,000
Cotton	500	140,000
Lumber, timber, and cord wood	160,000	335,000
Rice and rice flour	22,000	112,500
Fish, game, and vegetables	50	2,500
Miscellaneous	350	30,000
Total	203,900	990,000
INWARD FREIGHTS.		
Miscellaneous	17,000	850,000
Grand total	220,900	1,840,000

List of vessels plying Santee River, South Carolina, during calendar year 1903.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	*Feet.*	*Feet.*	
Eutaw	Side-wheel steamer	156.0	29.8	7.8	547
Gardenia	do	75.0	12.6	3.2	34
Frank Sessoms	Stern-wheel steamer	86.6	22.8	3.6	79
Louisa	do	101.0	25.0	5.0	280
Otto	Screw steamer	31.3	11.2	3.7	10
Janie	do	42.8	10.5	4.5	17
Pender	do	52.7	14.9	3.4	28
We Go	Schooner	44.0	13.7	4.3	18
Hugh	do	47.6	14.2	3.4	14
Etta	Sloop	47.0	11.0	3.3	8
Flora Temple	do	34.8	12.8	3.3	7
Clipper	do	31.0	11.0	2.9	10
Leilah	do	31.0	10.0	2.5	8
Liza Jane	do	40.8	12.5	4.9	17
Willie	Yacht	40.0	9.0	4.0	6
Loretta	do	40.0	9.0	3.0	7
Pelican	do	30.0	7.0	2.5	3

(B) WATEREE RIVER.

No work was done during the year; the only expenditure was for traveling expenses.

The river and harbor act approved June 13, 1902, ordered a preliminary examination of the river and directed that improvement should be suspended until further action by Congress. The report of the examination was submitted to Congress in December, 1903. See House Executive Document No. 185, Fifty-eighth Congress, second session.

In reviewing the report the Board of Engineers for Rivers and Harbors reported that the work needed was one of snagging only, and continuing in its nature, and gave its opinion that the work should not be undertaken until an anticipated increase of commerce on the Santee and Congaree rivers had come about. Since then a new line of transportation has been established between Columbia and Georgetown, S. C., via the Congaree and Santee rivers and the Esterville-Minim Creek Canal, to Winyah Bay. One small steamer was running on the line until it was burned in June of this year. It is the intention to replace the steamer. The time is, therefore, opportune to improve the Wateree River.

At present the stream is greatly obstructed by drift. It is a continuation of the Catawba River, which rises in the mountainous district of western North Carolina, and carries at times of freshets a large amount of drift. The banks are easily eroded. Boats can not navigate the river in the present condition. The obstructions should first be removed. The two snag boats belonging to the district, besides being needed elsewhere, are too small to make any material impression on the accumulations of débris. An appropriation of from $50,000 to $60,000 could be spent in thoroughly snagging the stream, allowing $10,000 for plant and $4,000 per month for operations. Afterwards the cost of maintenance would be $5,000 per year.

It is proposed to apply the available balance and additional appropriation recommended in thoroughly snagging the river to obtain a channel 4 feet deep.

Money statement.

July 1, 1903, balance unexpended		$190.75
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		17.36
July 1, 1904, balance unexpended		173.39
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$50,000.00	
For maintenance of improvement	5,000.00	
		55,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved March 3, 1881	$8,000	Approved July 13, 1892	$2,500
Passed August 2, 1882	15,000	Of August 18, 1894	2,500
Approved July 5, 1884	5,000	Passed June 3, 1896	5,000
Approved August 5, 1886	7,500	Approved March 3, 1899	2,500
Of August 11, 1888	12,000		
Approved September 19, 1890	12,500	Total	72,500

Total expenditures, including June 30, 1904, $72,326.61.

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
OUTWARD FREIGHTS.	Tons.	
Timber	41,000	$82,000
INWARD FREIGHTS.		
Miscellaneous merchandise	50	5,000
Grand total	41,050	87,000

List of vessels plying Wateree River, South Carolina, during calendar year 1903.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	Feet.	Feet.	
Janie	Screw tug	42.8	10.5	4.5	17

(c) CONGAREE RIVER.

After a stoppage of several months, snagging operations were resumed January 21, 1904, with the snag boat *Great Pedee*, and continued during the balance of the fiscal year. As the appropriation was then about exhausted, operations ceased and the snag boat will be transferred to the Santee River. There were removed 1,564 obstructions from the channel previously cleared by the Government, at a cost of $1.97 per unit.

About 80 per cent of the approved project had been completed up to June 30, 1904.

It is proposed to expend the available balance and appropriation recommended in keeping the river clear of snags and in deepening and widening the channel to the dimensions contemplated by the project.

Money statement.

July 1, 1903, balance unexpended		$3,475.63
Received (refunded by Maj. J. C. Sanford)		.50
		3,476.13
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		2,618.17
July 1, 1904, balance unexpended		857.96
July 1, 1904, outstanding liabilities		474.77
July 1, 1904, balance available		383.19
Amount (estimated) required for completion of existing project		18,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$15,000.00	
For maintenance of improvement	3,000.00	
		18,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

For this improvement the following appropriations have been made:

By act of Congress—	
Approved August 5, 1886	$7,500.00
Of August 11, 1888	7,500.00
Approved September 19, 1890	5,000.00
Approved July 13, 1892	5,000.00
Of August 18, 1894	4,000.00
Passed June 3, 1896	2,000.00
Approved June 13, 1902	5,000.00
Refunded by Major Sanford	.50
Total	36,000.50

Total expenditures, including June 30, 1904, $35,142.54.

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value,
OUTWARD FREIGHTS.	*Tons.*	
Timber	114,000	$228,000
INWARD FREIGHTS.		
Miscellaneous	310	43,400
Grand total	114,310	271,400

List of vessels plying Congaree River, South Carolina, during calendar year 1903.

Name.	Character.	Length.	Breadth.	Depth.	Gross tonnage.
		Feet.	*Feet.*	*Feet.*	
Armstrong	Stern-wheel steamer	60.0	12.5	2.5	22
Janie	Screw tug	42.8	10.5	4.5	17
Sadie	do	35.8	10.2	3.2	8

N 5.

IMPROVEMENT OF CONGAREE RIVER, SOUTH CAROLINA, FROM GERVAIS STREET BRIDGE, COLUMBIA, TO GRANBY.

Under the contract with the Evansville Contract Company for constructing the lock and abutment, 2,073 cubic yards of riprap were placed to protect the bank at the abutment end of the dam, at a cost of $1.95 per cubic yard. The contract has been completed and final payment will be made. The expenditures for the lock and abutment were $12,239.36.

Under the contract with the Evansville Contract Company for constructing a Chanoine movable dam without navigable pass at an estimated cost of $65,875, the entire dam was constructed and the contract completed except cleaning up. The expenditure was $38,851.43. Final payment will shortly be made.

To clear the channel above the lock as far as Columbia of bowlders and other obstructions, two lighters have been built with hired labor; plans have been prepared for a drill float, and some of the steel for drilling ordered. The expenditure was $2,008.65.

About 80 per cent of the approved project had been completed to June 30, 1904.

It is proposed to expend the available balance in completing payments on the contracts and in clearing the channel above the lock.

Money statement.

July 1, 1903, balance unexpended	$140,881.77
June 30, 1904, amount expended during fiscal year, for works of improvement	53,099.44
July 1, 1904, balance unexpended	87,782.33
July 1, 1904, outstanding liabilities	5,236.43
July 1, 1904, balance available	82,545.90
July 1, 1904, amount covered by uncompleted contracts	23,016.25

Amount and date of all appropriations for this work are as follows:

By act of Congress—	
Approved March 3, 1899	$50,000
Approved June 6, 1900	100,000
Approved March 3, 1901	50,000
Approved June 28, 1902	50,000
Total	250,000

Total expenditures, including June 30, 1904, $162,217.67.

LIST OF CONTRACTS IN FORCE.

Contract for—	Name of contractor.	Date of approval.	Date of beginning.	Date of completion.
Constructing lock and abutment.	The Evansville Contract Company.	Oct. 20, 1900	Nov. 29, 1900	[a] Jan. 30, 1902
Constructing Chanoine dam..	.....do	Nov. 6, 1902	Dec. 10, 1902	([b])

[a] Time limit waived.

[b] 150 working days.

EMERGENCY CONTRACT.

Name of contractor.	Contract for—	Price per pound.	Date of—		
			Contract.	Beginning.	Expiration.
		Cents.			
New Jersey Foundry and Machine Co.	4,550 pounds chain	6	June 30, 1904	July 5, 1904	Aug. 14, 1904
	1,650 pounds chain	6¼			

There is at present no navigation on this portion of the river.

N 6.

IMPROVEMENT OF THE INLAND WATERWAYS BETWEEN CHARLESTON HARBOR, SOUTH CAROLINA, AND OPPOSITE McCLELLANVILLE.

No work was done during the year, as titles to the lands required for the improvement have not yet been obtained.

A project for the expenditure of the appropriation will be submitted when the titles have been secured.

Money statement.

July 1, 1903, balance unexpended..	$50,000.00
July 1, 1904, balance unexpended..	50,000.00
Amount (estimated) required for completion of existing project	75,290.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	50,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATION.

By act of Congress approved June 13, 1902	$50,000

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
TOWARD MCCLELLANVILLE.	*Tons.*	
Fertilizers	1,300	$27,500
Stable manure	510	1,020
Oysters in shell	4,810	15,000
General merchandise	1,110	111,000
Total	7,730	154,520
TOWARD CHARLESTON.		
Sea-island cotton	164	91,380
Short-staple cotton	50	10,000
Cotton seed	100	1,300
Hay and grain	35	600
Rice	100	4,000
Vegetables	2,030	99,300
Palms	30	750
Lumber	6,750	27,000
Turpentine	300	37,500
Rosin	1,530	25,000
Clams	190	2,470
Oysters in shell	13,410	105,000
Oysters (canned)	350	15,000
Cord wood	500	1,200
Cattle, hogs, etc	45	4,500
Total	33,344	579,520

N 7.

IMPROVEMENT OF HARBOR AT CHARLESTON, SOUTH CAROLINA.

No work was done on the jetties.

The seagoing suction dredge *Charleston* worked the entire year, except the time spent on repairs. She removed 79,089 cubic yards from the eastern channel and 336,718 cubic yards from the main channel, making a total of 415,807 cubic yards, at a cost of 8½ cents per cubic yard.

The new dredge *Gen. Abbot* that has been under construction at Petersburg, Va., under a contract approved January 15, 1901, with the Petersburg Iron Works, at a cost of $144,300, arrived in Charleston in March, and worked at intervals until May 26, when she was sent to the United States navy-yard at Portsmouth, Va., to be coppered and to have repairs and changes made. While at work she removed 49,017 cubic yards from the eastern channel and 52,605 cubic yards from the main channel, a total of 101,622 cubic yards. The unit cost is not given, as the work was mainly in the nature of a test of the machinery. The dredge has not yet been turned over to the district.

The amount of material removed by both dredges was 517,429 cubic yards, which is 9⅗ per cent of the quantity originally estimated as necessary to be removed. The amount removed under the project is 1,351,637 cubic yards, which is about 25 per cent of the original estimate. The original estimate appears to be too large, as comparing the yardage removed by the dredges with the changes shown by the surveys shows that about as much material is removed by scour as by the dredges, and that the removal of less than 1,000,000 cubic yards more will give the required depth and width.

The annual survey shows a central depth of 27 feet at mean low water. This is the depth now from the city wharves to the ocean, a gain of 1 foot during the year. The narrowest portions of the 26-foot channel are in the eastern channel, about 250 feet wide. For the outer half of the main channel the project width of 600 feet is about attained.

The report of the advisability of extending the jetties with a view to providing a harbor of refuge was submitted to the Congress and is published in House Document No. 299, Fifty-eighth Congress, second session. The Board of Engineers for Rivers and Harbors recommended that the harbor be provided by dredging an entrance channel 28 feet deep at mean low water, 1,000 feet wide beyond the jetties, and 500 feet wide between them, at an estimated cost of $371,616.

It is intended to expend the available balance and the additional appropriation recommended in dredging the channel to the full project depth and width.

Money statement.

July 1, 1903, balance unexpended	$197, 761. 04
Amount appropriated by sundry civil act, approved April 28, 1904	73, 000. 00
Deposited by Maj. J. C. Sanford	. 28
Proceeds auction sale	110. 00
	270, 871. 32
June 30, 1904, amount expended during fiscal year, for works of improvement	113, 776. 56
July 1, 1904, balance unexpended	157, 094. 76
July 1, 1904, outstanding liabilities	8, 251. 95
July 1, 1904, balance available	148, 842. 81
July 1, 1904, amount covered by uncompleted contracts	19, 601. 00

Amount (estimated) required for completion of existing project		25, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$75, 000	
For maintenance of improvement	25, 000	
		100, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

For this improvement the following appropriations have been made:

By act of Congress—	
Approved June 18, 1878	$200, 000. 00
Approved March 3, 1879	200, 000. 00
Approved June 14, 1880	170, 000. 00
Approved March 3, 1881	175, 000. 00
Passed August 2, 1882	300, 000. 00
Approved July 5, 1884	250, 000. 00
Approved August 5, 1886	187, 500. 00
Of August 11, 1888	350, 000. 00
Approved Sept. 19, 1890	370, 000. 00
Approved July 13, 1892	225, 000. 00
Approved March 3, 1893	750, 000. 00
Approved August 18, 1894	450, 000. 00
Approved March 2, 1895	500, 000. 00
Approved June 6, 1900	220, 000. 00
By act of Congress—	
Approved June 13, 1902	$45, 000. 00
Approved June 28, 1902	50, 000. 00
Approved March 3, 1903	60, 000. 00
April 16, proceeds auction sales of Government property credited in Treasury of United States	85. 00
Deposited by Major Sanford	. 28
March 29, 1904, account sales at auction	110. 00
By act of Congress—	
Approved April 28, 1904	73, 000. 00
Total	4, 575, 695. 28

Total expenditures, including June 30, 1904, $4,418,600.52.

List of contracts in force (emergency contracts).

Contract for—	Name of contractor.	Date of contract.	Date of beginning.	Date of completion.
Building launch	E. O. Hall, jr	Feb. 2, 1903	Feb. 12, 1903	[a]July 1, 1903
Berth for dredge, storage room, and handling coal.	Consumers' Coal Co	Feb. 24, 1903	Feb. 26, 1903	Aug. 26, 1903
Do	do	Aug. 18, 1903	Aug. 26, 1903	Feb. 28, 1904
Furnishing coal	do	Oct. 15, 1903	Oct. 20, 1903	Oct. 30, 1903
Do	Hugh Ferguson	Mar. 18, 1904	Mar. 23, 1904	Apr. 12, 1904
Suction hose	New Jersey Car Spring and Rubber Co.	May 7, 1904	May 12, 1904	[a]June 27, 1904
Furnishing coal	Wm. Johnson & Co	May 17, 1904	June 1, 1904	June 21, 1904
Lease of wharf	Charleston Terminal Co	May 31, 1904	May 1, 1904	Apr. 30, 1907

[a] Time limit for completion waived.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels and commerce at Charleston, S. C., from January 1 to December 31, 1903.

	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Arrived	[a]444	1,124,449	25,454	1	665	11	90	100,967	1,862	534	1,126,081	27,327
Cleared	[b]91	108,803	1,775	1	143	6	56	40,421	984	148	149,367	2,765

[a] Of these, 6 vessels, 12,228 tonnage, with crew numbering 147 men, were foreign.
[b] Of these, 43 vessels, 77,228 tonnage, with crew numbering 1,094 men, were foreign.

Value of exports	$3,468,986.00
Value of imports	1,768,133.00
Duties collected	49,661.60

American vessels in coastwise trade cleared at custom-house only when bound south, out of Great District.

Commerce through Charleston Harbor, ocean entrance, calendar year 1903.

Articles.	Tons of 2,000 pounds.	Value.	Articles.	Tons of 2,000 pounds.	Value.
IMPORTS.			EXPORTS.		
Muriate of potash	8,577	$319,922	Lumber	123,204	$564,799
Kainit	65,282	541,840	Phosphate rock	25,265	73,313
Nitrate of soda	13,962	670,176	Manipulated fertilizer	5,618	123,581
Sulphate of potash	1,492	64,454	Clay	24,832	173,824
Manure salt	9,448	117,155	Cotton, upland	40,868	9,259,923
Pyrites	53,833	264,320	Cotton, sea-island	1,721	860,500
Tankage, garbage	2,839	58,505	Cotton goods	46,043	23,021,500
Fish scrap	11,291	254,385			
Cotton	630	151,200	Cotton-factory sweepings and lint	3,743	149,720
Coal	83,835	394,937	Cotton-seed oil	5,990	718,800
Salt	8,915	65,372	Soap stock	464	23,200
Rice	2,997	165,221	Cotton seed	1,268	20,950
Jute butts	5,271	197,650	Cotton-seed meal	361	6,498
Refined oil	4,716	87,603	Rice	1,910	143,250
Fruit	10,086	279,192	Rosin	1,865	20,249
Cocoanuts	375	13,880	Turpentine	399	44,885
Cement and plaster	24,771	212,434	Clams	275	3,665
Cotton seed	888	15,966	Coal	561	2,805
Coffee	1,357	156,756	Oysters, canned	235	22,915
Guano	896	8,960	Vegetables	175	7,875
Hoop iron	487	19,480	Miscellaneous	6,143	333,217
Old iron	1,800	12,600			
Creosoted piles and lumber	1,000	11,000	Total	290,910	35,575,469
Miscellaneous	80,215	8,000,950			
Total	394,963	12,083,958			

These commercial statistics do not include a large part of the business of Charleston which is done by the railroads, nor do they include the commerce passing over the rivers which enter the harbor, nor over the inland routes to the North and South. The commerce to and from Charleston through Wappoo Cut amounted to 153,594 tons, valued at $2,682,115, in the calendar year 1903; and through inland waterways to the North 33,344 tons, valued at $579,520, in the calendar year 1903.

The regular lines of steamships established between this and other ports comprise a total of 25 steamships.

N 8.

IMPROVEMENT OF WAPPOO CUT, SOUTH CAROLINA.

The work during the year consisted in obtaining plant to do the dredging at the Ashley River entrance, where the survey showed a shoaling to 6 feet. The work was advertised, but there were no bidders. It is the intention to do the work with the new combination clam shell and dipper dredge belonging to the Government.

Up to June 30, 1904, about 70 per cent of the approved project had been completed.

It is proposed to expend the balance on hand in widening and deepening the cut across the Ashley River bar to the project width and depth of 200 feet and 7 feet respectively, and in maintaining the project width and depth in the other portions of the channel.

Money statement.

July 1, 1903, balance unexpended	$7,871.44
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	711.20
July 1, 1904, balance unexpended	7,160.24
July 1, 1904, outstanding liabilities	214.27
July 1, 1904, balance available	6,945.97
Amount (estimated) required for completion of existing project	17,500.00

For this improvement the following appropriations have been made:

By act of Congress—		By act of Congress—	
Approved March 3, 1881	$10,000	Approved July 13, 1892	$10,000
Passed August 2, 1882	10,000	Of August 18, 1894	7,000
Approved July 5, 1884	3,000	Passed June 3, 1896	2,500
Approved August 5, 1886	5,000	Approved June 13, 1902	8,000
Of August 11, 1888	5,000		
Approved September 19, 1890	10,000	Total	70,500

Total expenditures, including June 30, 1904, $63,339.76.

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
	Tons.	
Rice	6,963	$348,169
Vegetables	7,193	389,123
Cotton	1,144	647,725
Cotton seed	511	8,682
Lumber	66,978	254,947
Phosphate rock	5,953	15,948
Manipulated fertilizer	2,980	65,660
Gravel and shells	43,631	33,817
Oysters	3,360	26,242
Oysters (canned)	119	10,558
Clams	138	1,835
Miscellaneous	14,624	879,409
Total	153,594	2,682,115

N 9.

IMPROVEMENT OF INLAND WATERWAY BETWEEN CHARLESTON AND BEAUFORT, SOUTH CAROLINA.

After the acquirement of the title to the land required for the canal through condemnation proceedings, the plant with which the work was to be done by hired labor was repaired, and at the close of the fiscal year was on its way to the site.

It is proposed to expend the available balance and additional appropriation recommended, in beginning the construction of the canal across Fenwick Island.

Money statement.

July 1, 1903, balance unexpended	$29,992.60
June 30, 1904, amount expended during fiscal year, for works of improvement	3,921.07
July 1, 1904, balance unexpended	26,071.53
July 1, 1904, outstanding liabilities	1,119.09
July 1, 1904, balance available	24,952.44
Amount (estimated) required for completion of existing project	31,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

Total expenditures, including June 30, 1904, $3,928.47.

APPROPRIATION.

By act of Congress approved June 13, 1902	$30,000

N 10.

IMPROVEMENT OF BEAUFORT RIVER, SOUTH CAROLINA.

The work during the year consisted in surveying the channel of Brickyard Creek and in preparing plant to dredge at the places where deterioration has occurred. The amount available is too small to admit of sending a dredge from a distance for this work alone.

About 75 per cent of the approved project had been completed to June 30, 1904.

The report of the examination ordered by the river and harbor act of June 13, 1902, is published in House Document No. 199, Fifty-eighth Congress, second session. The Board of Engineers for Rivers and Harbors reported against the improvement of Beaufort River below Beaufort, S. C.

It is proposed to expend the available balance and additional appropriation recommended in restoring the width and depth where deterioration has occurred.

Money statement.

July 1, 1903, balance unexpended		$2,387.67
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		537.17
July 1, 1904, balance unexpended		1,850.50
Amount (estimated) required for completion of existing project		9,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$9,000.00	
For maintenance of improvement	2,000.00	
		11,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

For this improvement the following appropriations have been made:

By act of Congress—	
Approved September 19, 1890	$12,500.00
Approved July 13, 1892	12,500.00
Of August 18, 1894	5,000.00
Passed June 3, 1896	1,000.00
Approved June 13, 1902	2,000.00
Total	33,000.00

Total expenditures, including June 30, 1904, $31,149.50.

COMMERCIAL STATISTICS, 1903.

Article.	Quantity.	Value.
	Tons.	
Phosphate rock	16,400	$41,000
Coal	250	1,000
Cotton, cotton seed, and miscellaneous merchandise	2,440	385,000
Lumber	70	900
Oysters and by-products	3,675	32,000
Total	22,835	459,900

Number and class of vessels that have navigated that portion of Beaufort River known as Brickyard Creek during calendar year 1903.

Kind.	Number.	Total tonnage.	Total value.	Number single trips.	Remarks.
Tugboats	3	180	$20,000	700	
Lighters	10	1,000	5,000	500	
Yachts (steam)	50	8,000	1,000,000	150	The Alameda made 100 trips.
Schooners (3-masted)	6	2,400	40,000	6	
Buoy tenders	1	500	40,000	4	
Revenue cutters	2	500	100,000	10	
Sloops and small schooners.	15	400	5,000	200	
Gasoline boat	1	20	2,000	20	
Dredge	1	150	30,000	4	
Passenger boats	2	600	20,000	104	Pilot Boy and Planter, carrying 2,500 passengers.
Pilot boats	2	95	4,000	30	

N 11.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

An allotment of $2,000 was made for removing the wreck of an old vessel which had been converted into a phosphate barge, and which lies in Ashley River, near Lambs, S. C. Bids for the removal of this wreck were excessive and were rejected. The wreck was removed by dynamite and Government plant to a depth of about 14 feet at low water, which is sufficient for the navigation of the river, with the exception of a small portion, which will soon be removed with dynamite.

Total expenditures, including June 30, 1904, $615.65.

EMERGENCY CONTRACT.

Name of contractor.	Contract for—	Price per day.	Date of—		
			Contract.	Beginning.	Expiration.
B. F. Kramer	Plant for removal of wreck.	$32.00	Apr. 22, 1904	May 2, 1904	Completion of work.

N 12.

PRELIMINARY EXAMINATION OF BEAUFORT RIVER, SOUTH CAROLINA, FROM ITS MOUTH TO BEAUFORT.

[Printed in House Doc. No. 199, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report dated April 7, 1903, by Capt. J. C. Sanford, Corps of Engineers, upon a preliminary examination of Beaufort River, South Carolina, from its mouth to Beaufort, authorized by the river and harbor act of June 13, 1902.

In the opinion of Captain Sanford the present and prospective commerce of the locality is not sufficient to warrant the expenditure required for its improvement, and this opinion is concurred in by the division engineer, Lieut. Col. J. B. Quinn, Corps of Engineers.

The Board of Engineers for Rivers and Harbors, which has reviewed this report, in accordance with the provisions of sections 3 and 14 of the above-mentioned act, states in report of July 17, 1903, that it is not desirable for the United States to undertake this improvement, and I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., April 7, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of Beaufort River, South Carolina, from its mouth to Beaufort, as provided for in section 14 of the river and harbor act approved June 13, 1902.

This portion of Beaufort River was partially surveyed in 1880 under Col. Q. A. Gillmore, Corps of Engineers, and again part of it was examined and surveyed in 1888 and 1889 under Capt. (now Maj.) Frederic V. Abbot, Corps of Engineers. Major Abbot quotes the following paragraph from Colonel Gillmore's report:

> As the Port Royal Railroad, having its terminus and wharves on deep water below the shoals referred to, connects the harbor of Port Royal Sound with Augusta and the western railroad system, passing close by the town of Beaufort, there would seem to be little if any necessity for making the improvements that have been described, for the reason that all freights arriving from the interior for transportation to foreign or domestic ports would be transferred to ocean-going vessels at the railroad wharves, and all freights arriving by vessels at Port Royal Sound for transfer to the interior would be loaded into railroad cars at the same place.

Major Abbot then adds:

> The only reason for changing the recommendations of Colonel Gillmore is that since 1880 the phosphate interests of Coosaw and Beaufort rivers have greatly increased, and every effort to make Port Royal a large shipping point has so far been a failure, while the business of Beaufort has, if anything, increased.

Major Abbot further reported that his recommendation would depend upon the result of a survey. This survey was made, and in November, 1889, Major Abbot reported thereupon. He determined that to improve the river to 15 feet depth at mean low water and 300 feet width from Beaufort to the Sea Island Chemical Works, now owned by the Coosaw Mining Company, would cost $116,000, and recommended against making the improvement on account of the cost, which he considered excessive, some of the material to be removed being rock.

Since 1889 conditions have again changed. The water commerce of Beaufort increased with the increase of the phosphate interests and with the establishment of the Port Royal naval station on the Beaufort River about 6 miles below the town of Beaufort. The maximum appears to have been reached in 1894, for which year the collector of customs at Beaufort reported the value of exports, as recorded at the custom-house, $4,939,417, and the value of imports $59,054.

The following table gives the custom-house records for the years 1894–1897 and 1899–1901, the record for 1898 not having been reported:

Year.	Value of exports.	Value of imports.
1894	$4, 939, 417. 00	$59, 054. 00
1895	4, 155, 619. 00	70, 382. 32
1896	4, 316, 259. 00	135, 482. 62
1897	2, 605, 896. 00	84, 651. 07
1899	358, 886. 00	76, 098. 00
1900	132, 561. 70	428, 896. 26
1901	166, 189. 00	136, 639. 60

The great falling off since 1894, and particularly since 1896, has been due mainly to the decline in the local phosphate business, occasioned by the rapid development of phosphate mines in Florida and other places, where conditions proved more favorable than at Beaufort. The largest phosphate company in the vicinity, the Coosaw Mining Company, went out of business about a year ago. The Virginia-Carolina Chemical Company is now operating a fertilizer factory on the Beaufort River, near Port Royal, and a comparatively small quantity of phosphate rock is still mined in the vicinity of Beaufort. In the latter part of 1900 it was decided to move the Port Royal naval station to Charleston, instead of rebuilding the Port Royal dry dock. The naval-station site has since been used more or less by the Navy Department for training and torpedo-boat purposes.

All the facts brought out by Colonel Gillmore, as above quoted, in regard to the Port Royal Railway (now known as the Charleston and Western Carolina Railway) hold good at this time. The business of the road has declined and there is now very little business at Port Royal. The interest which seems to be most desirous that the Beaufort River should be deepened is the Virginia-Carolina Chemical Company. The superintendent of this factory stated that he thought the output of his factory would be increased from 40,000 tons of fertilizer per annum to 75,000 tons if they could get deeper water to their wharves, so that foreign vessels carrying fertilizer materials could reach them. Their main trouble appears to be with a shoal opposite Cane Island and not far above the mouth of Battery Creek (known also as Port Royal Creek), where there is only 11 feet at mean low water. The United States Coast Survey chart shows deeper water on both sides of the shoal, but the channel is not well marked and is difficult to follow. In regard to this shoal, Major Abbot says:

> No estimate is made for dredging the shoal at Old Fort, mentioned in my preliminary report, as the survey shows that all that is needed is to have the existing channel properly marked.

Major Abbot's report and estimate were based on obtaining a channel 300 feet wide and 15 feet deep at mean low water, which depth appears to be what is now desired by the Virginia-Carolina Chemical Company.

The present and prospective commerce of Beaufort and of the Virginia-Carolina Chemical Company's Port Royal works are in my opinion not sufficient to warrant the expenditure required for dredging the channel desired at Cane shoal and for continuing the improvement to Beaufort (cost of latter work estimated by Major Abbot at $116,000). It is believed that a proper marking of the channel at Cane shoal will satisfy the present requirements of commerce.

Report of Mr. W. D. Niles, an employee of this office, and for many years a resident of Beaufort, giving commercial statistics of Beaufort River below Beaufort for the year 1901, is appended. The greater part of the commerce reported by him is of such a character that it is not shown by the custom-house records, being largely local, and much of it carried by small vessels. It includes that portion of the commerce of Port Royal which uses only the Beaufort River below Port Royal (estimated by Mr. Niles at $460,000), and is not interested in the improvement of the shoals in question, all of which are above Port Royal.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain of Engineers.

Brig. Gen. G. L. GILLESPIE,
Corps of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 13, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

The volume of commerce to be benefited by an improvement of such magnitude is not commensurate with the cost, and the opinions of the district engineer are concurred in.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 17, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

Additional information has been called for, if available.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 17, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given careful consideration to the within report of the district officer upon a preliminary examination of "Beaufort River [South Carolina], from its mouth to Beaufort," the indorsement of the division engineer thereon, and other data available. On June 16, 1903, a committee of the Board inspected the locality and held a public hearing, at which interested parties were afforded opportunity to express their views.

Beaufort River flows into Port Royal Sound about 12 miles inside Port Royal bar. Port Royal is upon a tributary of Beaufort River known as Battery Creek, about one-half mile above the mouth of the latter. Points upon Beaufort River are distant from its mouth approximately as follows: U. S. naval station, 5 miles; mouth of Battery Creek, 6½ miles; plant of Virginia-Carolina Chemical Company, 8 miles; plant of Coosaw Mining Company, 9½ miles; Beaufort, 11½ miles.

The river between Beaufort and the Coosaw Mining Company's plant was surveyed in 1889, and it appeared that a 15-foot channel through this stretch would cost $116,000. To-day no demand is made, even by citizens of Beaufort, for the improvement of this section.

The plant of the Coosaw Mining Company is now idle, with no immediate prospect of a resumption of operations.

The plant of the Virginia-Carolina Chemical Company is engaged in the manufacture of fertilizer. It has been equipped with wharf facilities, and through it are imported certain raw materials for the use of other factories in the interior belonging to the same company. In 1901 such imports were 19,300 tons, valued at $175,000; in 1902, 12,532 tons, valued at $121,000; in 1903 thus far, 3,400 tons, valued at $40,000. It is reported that these shipments may be expected to reach 27,000 to 30,000 tons per annum. The business is somewhat handicapped at present by the existence of a shoal reported to have a practicable depth of but 13 feet at low water.

Vessels drawing 25 feet may now reach the railroad wharf at Port Royal. Below the mouth of Battery Creek depths are ample for all present purposes.

In view of the very limited advantages to commerce that would follow an improvement of Beaufort River, the Board is of opinion that it is not advisable for the United States to undertake this improvement.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

LETTER OF MR. W. D. NILES.

MOULTRIEVILLE, S. C., *August 20, 1902.*

CAPTAIN: Complying with your directions, I submit the following tabulated statement of commercial statistics for the year 1901 of Beaufort River, South Carolina, below Beaufort. The data for the statement were obtained by correspondence and personal information:

Articles.	Tons.	Value.
Fertilizer materials	41,833	$241,000
Phosphate rock	103,774	266,457
Salt, coal, cement, lumber	16.876	83,000
General merchandise, cotton, and lumber	56,136	4,604,850
Coal and ice	11,800	43,175
Iron, brick, stone, slate, and machinery	20,000	150,000
Total	250,419	5,388,482

The number of passengers transported over the river was 46,000.

Statement showing number of vessels that have navigated Beaufort River, South Carolina, below Beaufort, during the calendar year 1901. This includes vessels of from 30 to 4,000 tons.

	Number of vessels.	Number of trips.	Tonnage.	Value.
United States Navy	21	400	23,239	
Revenue Service	2	20	500	
Light-House Service	2	10	500	
Fish Commission	1	1	441	
Merchant vessels	341	2,673	144,513	$12,123,000
Total	367	3,104	169,193	12,123,000

W. D. NILES.

Capt. J. C. SANFORD,
Corps of Engineers, U. S. A.

N 13.

PRELIMINARY EXAMINATION OF BLACK RIVER, SOUTH CAROLINA, FROM ITS MOUTH TO KINGSTREE.

[Printed in House Doc. No. 238, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated April 8, 1903, by Capt. J. C. Sanford, Corps of Engineers, on preliminary examination of Black River, South Carolina, from its mouth to Kingstree, ordered by the river and harbor act approved June 13, 1902.

In the opinion of Captain Sanford, concurred in by the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers, this locality is not worthy of improvement by the General Government.

The Board of Engineers for Rivers and Harbors has considered this report, pursuant to the provisions of sections 3 and 14 of the abovementioned act, and has held a public hearing with a view to obtaining expressions from interested parties. In the report of the Board, dated July 7, 1903, the opinion is expressed that it is not advisable for the United States to undertake the improvement of this stream, and I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

United States Engineer Office,
Charleston, S. C., April 8, 1903.

General: I have the honor to submit the following report upon a preliminary examination of Black River, South Carolina, from its mouth to Kingstree, made in accordance with the requirements of the river and harbor act approved June 13, 1902:

A preliminary examination of this river from its mouth to Kingstree was made in 1880, under Capt. Charles B. Phillips, Corps of Engineers (printed in Annual Report of Chief of Engineers for 1881, pp. 1040–1042). The following description and conclusions are quoted from his report:

> The Black River empties into the Great Pedee River at a point about 4 miles above the town of Georgetown, S. C. The total distance by river from the town of Kingstree to its mouth is 120 miles. From the mouth for a distance of something over 45 miles, or to what is known as Pine Tree Landing, a deep and navigable river is to be found, free from obstructions and with a depth of at least 10 feet at all stages. Steamers run regularly upon this portion of the river, and no improvement seems necessary.
>
> Above Pine Tree Landing for a distance of 11 miles, or to Potato Ferry, the river is very crooked and shoal. This portion of the river is occasionally navigated by light-draft steamers, but not more than 3 feet of water can be depended upon. The bot-

tom is mostly rock, and an immense expense would be involved in attempting to excavate a channel through it—an expense which would not be warranted by the present importance of the navigation in the river.

Above Potato Ferry and from thence to the town of Kingstree there is literally no navigation, the river being almost a continuous shoal, with less than 1 foot of water at low stages. Nor does it appear that if this portion of the river were opened to navigation much use would be made of the increased facilities for transportation. I have not deemed it necessary to make estimates for the improvement of any portion of this river and none are submitted.

A second preliminary examination of the same portion of this river was made in the winter of 1890-91 under Capt. W. H. Bixby, Corps of Engineers, by Lieut. Mason M. Patrick, Corps of Engineers (printed in Annual Report of Chief of Engineers for 1891, pp. 1435-1440). The report gives much valuable information as to this stream. Captain Bixby states that he regards the river as worthy of improvement by the General Government "so far as to clear out its natural obstructions, such as snags, fallen and overhanging trees, etc., from its mouth upward 118 miles to the railroad bridge at Kingstree, at a total expense of $25,000." No appropriations have been made.

I append report of Assistant Engineer Reid Whitford on the preliminary examination of 1902. As the lower portion of the river needs no improvement, as the upper portion could not be improved to a sufficient depth to permit a regular steamboat navigation, except at great expense, and as there is no present or prospective commerce which would warrant improvement of this river from its mouth to Kingstree, it is not, in my opinion, worthy of improvement by the Government.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 16, 1903.

Respectfully submitted to the Chief of Engineers, United States Army, the conclusions of the district engineer being concurred in.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 25, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

Additional information has been called for, if available.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 7, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of "Black River, from its mouth to Kingstree," the indorsement of the division engineer thereon, and other data available. The Board advertised and held on June 18, 1903, a public hearing on this matter at Georgetown, S. C., but no interested parties appeared to advocate the proposed improvement.

From Kingstree to the mouth of Black River is a distance variously estimated at from 90 to 120 miles. The lower 45 miles is of ample depth and unobstructed, and upon it is borne annually a commerce exceeding 25,000 tons, valued at about $700,000. The remainder of the river is obstructed by snags and shoals, and has been but little used in recent years. The low-water width of the stream at Kingstree is about 10 feet. The cost of improving the upper section would be disproportionate to resulting commercial advantages.

The Board concurs in the opinion of the district officer that it is not advisable that the United States should undertake the improvement of this stream.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of Board.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., August 22, 1902.

CAPTAIN: In compliance with your letter of July 31, 1902, I have the honor to report as follows on the preliminary examination of Black River, South Carolina, from its mouth to Kingstree:

The examination was made with the view of investigating the commercial importance of the river, present and prospective, in order that a decision might be formed, based on this data, as to whether the river was worthy of a detailed survey looking to the formation of a new estimate and project for its future improvement. The examination covers that portion of the river from Kingstree, which is generally taken as the present head of navigation, to its mouth at Georgetown, S. C.

GENERAL FEATURES.

The river has its source in Kershaw County, S. C., and is said to be about 200 miles in length, but below Kingstree, of which this report treats, it is about 90 miles in length. This latter distance was obtained from quite a correct map recently made to the mouth of Mingo Creek by the Atlantic Coast Lumber Company, of this place, in the location of their timber lands lying adjacent to the river, and from map of United States Engineer Department of distance between mouth of Mingo Creek in Black River to the mouth of the Black at Georgetown, made in 1889 under the direction of Capt. Frederic V. Abbot, Corps of Engineers, U. S. Army, in a very rapid manner, and is to be taken as being only fairly correct.

The first 40 or 50 miles of the stream, from its mouth upward, is wide and deep and free of obstructions, being open for uninterrupted navigation at all times. Vessels drawing 12 feet have ascended that far without difficulty. The remainder of this distance is, for the most part, crooked and narrow, and badly choked with fallen timber and obstructed by sand bars.

During the periods of drought upper portions of the river narrow to mere streamlets. The undersigned has noticed this particularly to be the case just below the North-Eastern Railroad bridge at Kingstree, where the water was not over 10 feet in width. The influence of the lunar tides is probably felt 50 or 60 miles above the mouth in the dry season, and farther on the current is very sluggish, the fall of the river being very little.

HISTORY OF EXAMINATIONS.

The first of these of which this office has any record, made by the United States Government, was under the direction of Capt. Charles B. Phillips, Corps of Engineers, U. S. Army, whose report is on pages 1040–1041, Annual Report of the Chief of Engineers for 1881. He says:

"I have not deemed it necessary to make estimates for the improvement of any portion of this river, and none are submitted."

The next examination was made in 1891, under the direction of Capt. W. H. Bixby, Corps of Engineers, U. S. Army, whose report begins on page 1435, Annual Report of the Chief of Engineers for 1891. He says:

"Under these circumstances, I regard the Black River, South Carolina, as worthy of improvement by the General Government so far as to clear out its natural obstructions, such as snags, fallen and overhanging trees, etc., from its mouth upward 118 miles to the railroad bridge at Kingstree, at a total expense of $25,000."

In regard to the commerce then on the river, Captain Bixby says:

"At present a steamer runs over the lower 40 miles of river, making regular weekly or semiweekly trips and carrying about $1,200,000 of annual commerce, most of which comes from Mingo Creek, one of the tributaries of the river. On the upper 80 miles of the river the present commerce is only about $100,000 per year, but it is estimated that this might readily be increased to $500,000 per year if the river were properly cleared out by the mere removal of snags and fallen trees from its channel and leaning and overhanging trees from its banks, at a cost of not over $25,000, thus developing $16 of annual commerce for each $1 once spent in the improvement."

Attached to Captain Bixby's report is one of Lieut. Mason M. Patrick, Corps of Engineers, U. S. Army, who made the examination in person and covers every detail of it most thoroughly.

The next examination provided for, under river and harbor act of June 13, 1902, is the one authorized in your letter of July 31, 1902, to which the following report relates:

HISTORY OF IMPROVEMENTS.

No works of improvement have ever been attempted, so far as known, by the United States Government.

Several acts were passed by South Carolina for the improvement of this stream, but whether or not any work was carried on, and with what result, is not stated.

The first of these was under the Colonial Government in 1738, when a commission was appointed, consisting of several citizens, "who were authorized to make the said river navigable" in certain specified places. The work was to be done by "the labor of the inhabitants and owners of the land lying adjacent to the said river." (See Statutes at Large, South Carolina, Vol. VII, by David J. McCord, 1840, published at Columbia, S. C., by A. S. Johnston.)

The next act was in 1753, under the Colonial Government, when another commission was appointed to carry out certain works of improvement on said river. (See p. 503, same volume.)

The next act was by the South Carolina legislature, under State government, in the year 1784 (p. 535, same volume), requiring "that all male inhabitants from the ages of 16 to 60 residing within 4 miles of said river" should work on the river for six days in the year and keep it clear of obstructions, etc.

In 1813 (see p. 583, same volume) another act was passed by the South Carolina legislature relating to the improvement of the river, and in 1817 another, and the last one of which any record could be found. (See p. 588, same volume.)

EXAMINATION OF RIVER JUST COMPLETED.

The river has just been examined by steam launch to the "Big Whirl," about 41½ miles above mouth, being about 11½ miles above the mouth of Mingo Creek the latter place being as far up as there is any commerce, present or prospective, carried in bottoms.

The river was found to be entirely free and unobstructed for safe navigation, requiring no work to improve it or maintain it as far up as examined. Above the mouth of Mingo Creek there is no commerce at all, present or prospective, except some sawmill logs which are drifted down with the current, and it is evident, from careful inquiry among business men and shippers who are in a position to know, that, should the river be improved above the mouth of Mingo Creek, there would be so little return of commerce, probably, that it would be inadvisable at this time for the Government to expend any money for the purpose.

A careful investigation was made of the commerce now on the river, shipping books were thoroughly searched, and statements made up item by item. Twenty-two thousand four hundred and thirty-five tons, valued at $642,482, were all that could be found for which the river could be given credit for fiscal year ending June 30, 1902. All this came from Mingo Creek and below its mouth in the Black River, where the stream requires no improvement, and, as stated, nothing came from above that point except $20,000 or $30,000 worth of ton timber.

There are no mills on the river and no important shipping points. The commerce is carried on by one stern-wheel steamer of 86 tons, one screw steamer of 53 tons, several small steam and naptha launches, numerous pole boats, of which no account could be gotten, and occasional trips of harbor tugs for towing rafts and the like.

At one time there was a steamer making occasional trips to Potatoe Bed Ferry, approximately 53 miles above mouth of river, bringing down naval stores mostly; but it is understood that when the turpentine lands became exhausted the steamer was withdrawn, and there has not been sufficient trade to recall a boat since.

Under the present existing circumstances the undersigned is of the opinion that from a commercial point of view Black River is not worthy of improvement by the General Government, and therefore requires no survey or map with the view of forming a new estimate for its improvement, and for these reasons no recommendations are presented in regard to the expenditure of any money for the improvement of the river.

If at any time it should become desirable to provide unobstructed navigation on the upper portion of the stream, because of its commercial development, no reason is known why Captain Bixby's report referred to above should not be used on which to base plans for simply clearing the channel of snags and the banks of overhanging trees, as outlined by himself.

Very respectfully, your obedient servant,

Reid Whitford,
Assistant Engineer.

Capt. J. C. Sanford,
Corps of Engineers, U. S. A.

N 14.

PRELIMINARY EXAMINATION OF CHARLESTON HARBOR, SOUTH CAROLINA.

[Printed in House Doc. No. 499, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, January 27, 1904.

Sir: I have the honor to submit herewith a report, dated April 9, 1903, by Capt. J. C. Sanford, Corps of Engineers, on preliminary examination of Charleston Harbor, South Carolina, to ascertain the advisability of extending the jetties with a view to providing a harbor of refuge. This report is made in pursuance of a requirement in the river and harbor act of June 13, 1902, and Captain Sanford is of opinion, concurred in by the division engineer, Lieut. Col. J. B. Quinn, Corps of Engineers, that the locality is not at the present time worthy of improvement as a harbor of refuge by further jetty extension. The report has been reviewed, under the provisions of sections 3 and 14 of the said act, by the Board of Engineers for Rivers and Harbors, which has visited the locality, through a committee, and held a public hearing, at which interested parties were afforded an opportunity to express their views.

Pursuant to the recommendation of the Board, in report of June 19, 1903, the district officer, Capt. G. P. Howell, Corps of Engineers, has prepared estimates of the cost of dredging channels of 28 feet and 30 feet depth, 1,000 feet wide outside the jetties and 500 feet wide inside the jetties, and for extending the north jetty. Further consideration has been given the matter by the Board, final report being made in indorsement of December 22, 1903, in which it concludes that it is advisable for the United States to undertake the improvement of Charleston Harbor by means of dredging with a view to producing an entrance channel 28 feet deep at mean low water, 1,000 feet wide beyond the jetties and 500 feet wide between them, at an estimated cost of $371,616, the annual cost of maintenance being estimated at $40,000.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

A. MACKENZIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., April 9, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of Charleston Harbor, South Carolina, "to ascertain the advisability of extending the jetties with a view to providing a harbor of refuge," the examination being made in accordance with the requirements of the river and harbor act approved June 13, 1902:

The history of the Charleston Harbor jetties and the results obtained thus far from their construction assisted by dredging are well known and will not be described at length here. The jetties were constructed under a project for obtaining a channel 21 feet deep at mean low water and of navigable width. They were completed in 1895. The north jetty is about 15,640 feet long, and the south jetty about 19,100 feet long, the south jetty projecting seaward about 600 feet farther than the north jetty. In each of these there is a gap of considerable length near the shore end, in which the jetty was not built up to low water.

The river and harbor act approved March 3, 1899, adopted a project for obtaining a channel from Charleston to the ocean not less than 26 feet deep at mean low water (mean range of tide about 5.2 feet) and 600 feet wide, the work to be done by dredging, if possible. Dredging has since continued under this project, but with some interruptions. There is now a depth of practically 26 feet throughout the length of the channel, an increase of about 2 feet since last summer. The channel is being widened to the project width. As shown on the inclosed Coast Survey chart,[a] the 26-foot channel across the outer bar (at the date of the chart the least depth was 24 feet) makes with the jetty channel, which is nearly parallel to the outer portions of the jetties, an angle of about 24°.

This direction was chosen for the dredging because the large shoal just south of the dredged channel showed a steady movement toward the prolongation of the jetty channel as well as seaward, the movement of the shoalest part seaward being about three times as rapid as its movement toward the jetty channel prolonged. This shoal appears to have been formed mainly by deposit of material scoured out from between the jetties. A comparison of charts shows a steady movement of the shoal from a position between the ends of the jetties to its present position. The shoal is becoming smaller, partly by natural forces and partly by dredging. The following, stating results of survey of the spring and summer of 1902, concerns this shoal, and is quoted from the Annual Report, Chief of Engineers for 1902, page 1170:

> The curves on the outer shoal have moved seaward generally, but no outward movement is shown in the 26-foot curve. The area of less than 12 feet is now very small, and the area of less than 18 feet on the main portion of the outer shoal is smaller than it was last year by about 7 per cent of the larger area. The area less than 21 feet at low water beyond the jetties and between the prolongations of their inner edges was 153 acres in June, 1897, 144 acres in January, 1898, and 129 acres in 1902. The area less than 18 feet was 82 acres in 1897, 77 in January, 1898, and 67 in 1902. The area less than 12 feet was 8 acres in 1897, 6 in 1898, and less than 1 acre in 1902.

Before an entrance channel on the line of the jetty channel prolonged can be maintained without considerable annual expense, this entire shoal south of the 26-foot dredged channel and north of the jetty channel should be removed. As a perfectly straight entrance channel is extremely desirable, the improvement of the entrance should have as its ultimate aim the entire removal of the shoal. With the shoal removed, the approach from sea to the sheltered channel between the jetties would be comparatively easy and unobstructed in all weather.

The object of the preliminary examination, as stated above, is "to ascertain the advisability of extending the jetties with a view to providing a harbor of refuge." This question is discussed at length in the appended report of Assistant Engineer James P. Allen. He considers it under the three following heads:

First. Is a harbor of refuge needed on this part of the coast?

Second. Is Charleston the best point at which to provide such a harbor?

Third. Is it advisable to extend the jetties to facilitate the use of this harbor as a harbor of refuge?

In connection with the first head, the early construction of an isthmian canal is to be considered, with the consequent probable increase of vessels passing along this coast; also the recent establishment of a naval station at Charleston, where the construction of a large dry dock, machine shops, etc., has been authorized by Congress.

As to Mr. Allen's second head, the comparative ease and safety with which the Charleston jetty channel can even now be entered in bad weather, the deep and commodious anchorage in the lower portion of the harbor, the fact that necessary repairs can be made and supplies obtained at the city, the nearness of the latter to the ocean as compared with other cities along the South Atlantic coast, and its central position on this coast, together with the fact that a greater entrance depth exists than at any other harbor on the coast south of Hampton Roads, would seem to render Charleston Harbor the most suitable point between Cape Hatteras and Cape Florida as a harbor of refuge.

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[a] Not printed.

Mr. Allen discusses the advisability of extending the jetties to facilitate the use of this harbor as a harbor of refuge. He concludes that extending the north jetty to the 28-foot curve about 10,000 feet, and dredging to a depth of 28 feet, the area between this prolongation and the line of the south jetty prolonged, as well as outside both jetties and between the lines of these prolonged, if a less depth is found there, would make a harbor of refuge sufficient for all present and probable future requirements. Throughout his discussion the harbor of refuge question is in general treated as entirely distinct from the question of future improvement of the harbor entrance.

The extension of the north jetty, as proposed by Mr. Allen, would cost several millions, and in my opinion is not now justified by the needs of navigation. I am particularly inclined to this opinion by a consideration of the fact that, if the large shoal in front of the jetty entrance were wholly removed to a sufficient depth, which could be done, including dredging out the area between the ends of jetties for about 2,000 feet in length, at, perhaps, one-fifth to one-sixth the cost of extending the jetty, a very good harbor of refuge would be produced, and one which would, I believe, satisfy the needs of navigation for some time to come. Moreover, the removal of this shoal is directly in line, as stated in the early part of this report, with what appears to be ultimately needed in the improvement of the entrance channel; whereas it is not impossible that the extension of the jetty might, by producing further concentration at the entrance, have a deleterious effect upon the inner harbor.

In my opinion, Charleston Harbor is not, at the present time, worthy of improvement as a harbor of refuge by further jetty extension, but is worthy of improvement as a harbor of refuge to the extent of removing the outer shoal, etc., as outlined above.

No survey is required, as all necessary data can be obtained from the annual harbor survey to be begun soon.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 17, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

There appears to be no real necessity for the present extension of the jetties seaward. There is obvious necessity for extending the south jetty so as to close the gap at the shore end. The loss of head in the jetty channel, due to this lateral escape, materially affects the scouring effects between the jetties. I am doubtful if the act contemplates such rearward extension, but it is evident that if the entrance were straight and commodious the question of the harbor being a harbor of refuge would be settled.

The views of the district engineer as to the extension of the jetties are concurred in.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS U. S. ARMY,
April 25, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., June 19, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given careful consideration to the within report of the district officer upon a preliminary examination of Charleston Harbor, S. C., "to ascertain the advisability of extending the jetties with a view to providing a harbor of refuge," the indorsement of the division engineer thereon, and other data available. On June 17, 1903, a committee of the Board inspected the locality and held a public hearing at which interested parties appeared to advocate the improvement.

Below Hampton Roads, Virginia, there is no harbor of refuge upon the South Atlantic coast suited to deep-draft vessels. The United States has recently begun at Charleston Harbor the construction of a dry dock and other accessory plant with a view to the establishment of an important navy-yard. Charleston Harbor has now ample depths in a capacious anchorage area, and the channel of entrance is 26 feet deep at mean low tide.

Immediate naval advantages and ultimate gain to commerce would follow the improvement of Charleston entrance to such an extent as would afford easy entrance to deep-draft vessels in heavy weather, at any stage of the tide.

For the purpose of making comparisons of cost with resulting advantages, the Board recommends that the district officer be directed to prepare estimates of cost of two different channels, to be obtained in each case by dredging, both with and without jetty extension; the first estimate to be for a channel 1,000 feet wide and 30 feet deep beyond the jetties, and the second for a channel 1,000 feet wide and 28 feet deep beyond the jetties. In each case the channel within the jetties, while of similar depth to that outside, may be reduced in width to 500 feet.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

[Fourth indorsement.]

Office Chief of Engineers, U. S. Army,
July 10, 1903.

Respectfully referred to Capt. G. P. Howell, Corps of Engineers, who is directed to prepare the estimates of cost recommended by the Board in preceding indorsement.

To be returned.

A. Mackenzie,
Acting Chief of Engineers.

[Sixth indorsement.]

U. S. Engineer Office,
Charleston, S. C., October 3, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The following estimates have been prepared from surveys made June and August, 1903, extending to the 30-foot contour·

30-FOOT CHANNEL.

Dredging outside jetties, 1,000 feet wide.

Material (place measurements)	cubic yards	2,437,294
Additional 50 per cent for shoaling and increase of bin over place measurement	cubic yards	1,218,647
		3,655,941
Cost, 10 cents per cubic yard		$365,594
Add 10 per cent for contingencies		36,559
		402,153

Dredging inside jetties, 500 feet wide.

Material to be dredged	cubic yards	1,130,638
Additional 50 per cent	do	565,319
		1,695,957
Cost, 10 cents per cubic yard		$169,595
Add 10 per cent		16,959
		186,554

Extension of north jetty 13,850 feet.

1,158,883 cubic yards stone, at $2.50	$2,897,208
Add 10 per cent	289,720
	3,186,928

28-FOOT CHANNEL.

Dredging outside jetties, 1,000 feet wide.

Material to be dredged	cubic yards	1,566,689
Additional 50 per cent	do	783,345
		2,350,034
Cost 10 cents per cubic yard		$235,003
Add 10 per cent		23,500
		258,503

Dredging inside jetties, 500 feet wide.

Material to be dredged .... cubic yards..	685,537
Additional 50 per cent .... do....	342,769
	1,028,306
Cost 10 cents per cubic yard	$102,830
Add 10 per cent	10,283
	113,113

Extension of north jetty 10,000 feet.

754,773 cubic yards, at $2.50	$1,886,933
Add 10 per cent	188,693
	2,075,626

For reasons stated in the attached report of Mr. Allen, the extension of the north jetty alone is considered. The estimate is based upon extending the jetties without foundation mattresses to a height of 12 feet above mean low water, with side slopes of 1:1½. The stone would be brought to a narrow crest. The height would ultimately be reduced to high water under the action of the waves.

The unit rate for dredging, 10 cents per cubic yard, is based upon the cost of operating the dredge *Charleston* for the past three years, including office expenses.

On September 1 there was an available balance for improving Charleston Harbor, of $108,338.41; there remained to be appropriated by Congress out of the amount authorized, $163,000; total, $271,338.41.

G. P. Howell,
Captain, Corps of Engineers.

[Eighth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, October 10, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, inviting attention to the foregoing indorsements.

In its further consideration of this matter the Board is requested to give study to the advisability of raising the shoreward portion of one or both of the jetties, with the view of increasing the scour, and thereby assisting in obtaining and maintaining the desired depth and direction for the entrance channel.

Captain Howell is in error as to the amount, stated by him in sixth indorsement hereon, as remaining to be appropriated by Congress out of the contract authorizations. This balance is $98,000, and is the amount of the estimate submitted by the Chief of Engineers in the current annual report and in the annual estimates to be furnished the Treasury Department by the Secretary of War.

Attention is invited to the fact that the balance available September 1 will not be applicable to the new project now under consideration without special authority from Congress, and further that this balance may be materially reduced before such authority will be granted, should Congress act favorably upon the new plan to be presented.

It is believed that both the balance now available and the further amount pledged by Congress will be needed in connection with securing and maintaining the present authorized project dimensions, and that neither of these amounts should be considered in connection with the estimates for increased channel depths.

By command of Brig. Gen. Gillespie:

H. F. Hodges,
Major, Corps of Engineers.

[Ninth indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., December 22, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has reviewed the report of the district engineer in the light of the additional data contained in the sixth indorsement hereon.

In response to a query by the Board, the district officer has stated his belief that $40,000 annually would maintain the channel hereinafter referred to.

Weighing the advantages against the cost, the Board recommends that it is advisable to undertake the improvement of Charleston Harbor, South Carolina, by means of dredging, with a view to producing an entrance channel 28 feet deep at mean low water, 1,000 feet wide beyond the jetties, and 500 feet wide between them, at an estimated cost of $371,616. The annual cost of maintenance is estimated at $40,000.

As directed by the Chief of Engineers in the preceding indorsement, the Board has studied the advisability of raising the shoreward portion of one or both of the jetties. As the result of such study the Board expresses the opinion that such work should not be done, for the reason that it would add to the difficulties of maintaining the channel beyond the jetties, and this without compensating advantages.

For the Board:

A. M. Miller,
Lieut. Col., Corps of Engineers,
Senior Member Present.

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

United States Engineer Office,
Charleston, S. C., September 16, 1902.

Captain: I have the honor to submit the following report of an examination of "Charleston Harbor, to ascertain the advisability of extending the jetties with a view to providing a harbor of refuge:"

This requirement of Congress would seem to involve the consideration of three questions:

First. Is a harbor of refuge needed on this part of the coast?

Second. Is Charleston the best point at which to provide such a harbor?

Third. Is it advisable to extend the jetties to facilitate the use of this harbor as a harbor of refuge?

Some harbor of refuge is needed on the South Atlantic coast for vessels engaged in the coasting trade in which all of that section of the country bordering upon the Atlantic and the Gulf of Mexico is directly interested. Such a harbor is also needed for vessels in foreign trade, and for the United States Navy. In the long stretch of shore line from Chesapeake Bay to the Gulf of Mexico there should be at least one harbor made especially easy of access in gales. Charleston Harbor seems to be the best to be improved for this purpose. It is practically land locked; there are several good and roomy anchorages; it is even now comparatively easy of entrance in a storm, and the channel, when completed, will be nearly straight; the holding ground for anchors is good. About the only competitor as a harbor of refuge along this part of the coast from Cape Hatteras to the capes of Florida is Port Royal Sound. Savannah and Cape Fear have no protected roadstead. The harbors south of Savannah can none of them be made very safe entrances for deep-draft vessels without the expenditure of large sums of money, and no one of them would furnish so good an anchorage as Charleston Harbor, after an entrance had been effected.

The Government has already expended, to include June 30, 1902, $4,239,757.67 in improving the entrance to Charleston Harbor, which improvement contributes to the end in view. The existing project calls for a depth of 26 feet at mean low water. There is already a channel with a central depth of 24 feet at mean low water.

Charleston Harbor possesses decided advantages over Port Royal Harbor. It is easier of entrance in a storm. Port Royal bar is so far offshore that in the mist accompanying a storm it is impossible to distinguish marks on shore. Further, the sea on Port Royal bar is very heavy, and a vessel must get very close to them before she can pick up the buoys. The channel at Port Royal entrance is not straight. There have been many wrecks near Port Royal, relatively few near Charleston, and these generally due to other causes besides entering in a storm. There was a severe storm in 1898, and at least four vessels were wrecked within a short distance of Port Royal entrance. In twenty-three years since the jetties were begun, only four vessels have been wrecked near Charleston. One of these was entering the old south channel before the completion of the jetties and getting out of the control of the tug went on the western shoal in a sharp easterly blow. A tug entering Pumpkin Hill channel struck and sunk after getting within the jetties. A small schooner, the *Potosi*, struck the south jetty and sunk behind it. In 1893, the schooner, *Kate V. Aitken*, in going to sea, got on the shoal to the north of the channel and was lost. The wind was strong from the southwest but there was no storm. All these considerations seem to point to Charleston Harbor as the most suitable point for a harbor of refuge.

The third question then presents itself, viz: Is it necessary to extend the jetties to facilitate the use of this harbor as a harbor of refuge? The main objection at present to entering Charleston Harbor in the time of a storm is that the entrance channel is narrow and not straight. There is one small dredge now working constantly to widen and straighten as well as deepen this channel, and another and larger dredge is being built for the same work. The extension of the jetties is no part of the existing project. In my opinion, the extension of the north jetty would improve the entrance in the time of a storm by providing a breakwater at a part of the entrance where the seas are usually very high, by allowing vessels to get more quickly under cover, and by placing the real entrance of the jetties in smoother water. The questions then are in what direction it should be extended, and for what length, or to what point. It seems to me best to prolong the jetty on the same line as the present outer end for the following reasons: The storms which are most feared are those occurring in July, August, September, and October, but mainly in August and September. These storms or hurricanes originate generally in the Atlantic Ocean, east of the Lesser Antilles, or in the Caribbean Sea, and follow a curved path along the Greater Antilles and the southeastern coast of the United States. I quote the following from Bulletin No. 32 on Hurricanes, William H. Alexander, observer, Weather Bureau:

"In addition to the circular vortex motion just described, the hurricane has a translatory movement; the center describes a path resembling a parabola whose opening between the branches is directed toward the east. The rate at which the center moves along this path varies not only in different hurricanes, but even in the same hurricane at the different stages of its progress. The path of the hurricane may be considered as made up of three divisions, viz, the first branch, the recurve, and the second branch. It is highly probable that while the hurricane is passing along the first branch the rate of movement is slightly on the increase, while in the vicinity of the recurve the rate is retarded, especially at the recurve of narrow parabolas where the vortex may remain practically stationary for a time. In the second branch of the track this translatory motion increases steadily and may attain 30 or 40 miles an hour. Perhaps 18 miles an hour would be a fair average for the hurricane along the first branch of its path."

A diagram given in the same pamphlet shows the path of six typical storms. The mean paths of the centers of August storms and of the September storms do not cross the shore line of the United States at all, as shown in another pamphlet from the Weather Bureau published in 1900, and written by E. B. Garriott, professor of meteorology. These paths are not very far from the coasts of Florida, Georgia, and South Carolina, and nearly parallel thereto. Now, as the direction of the wind around the storm center is contrary to the motion of the hands of a watch in the Northern Hemisphere, the direction of the wind at Charleston during the greater part of these storms will be from the northeast. When the wind changes it will frequently be to back into the northwest, which will be offshore and harmless. But even if the wind changes by southeast to southwest (as when the storm enters the land and passes out north of Charleston) the recurve is usually in a lower latitude, and as the center is supposed to move faster on the second branch, the duration of the storm after the wind has passed the direction of southeast should be short. As the value of a harbor of refuge is greatest in the first stages of a hurricane, protection from the northeast is most important. The general conclusion would seem to be that the best direction in which to extend the north jetty to form a breakwater would be about southeast. As the present direction is nearly southeast, it is best simply to prolong the line of its present outer end. If any change was made, it should be toward the south, but this would render entrance more difficult, and would otherwise be objectionable. The prolongation of the north jetty on its present line, or thereabout, would have another decided advantage. The shoal beyond the present ends of the jetties is formed largely by wave action, and the fact of its being under the lee of the extended jetty would render its removal easier and diminish the danger of its reforming.

There does not appear to be any good reason for extending the south jetty. The storms with the wind from the southwest are usually less violent, and vessels striving to enter Charleston in such a storm would have the alternative of anchoring in the lee of the extended north jetty, for which there would be ample room and good anchorage. Moreover, the extending of the south jetty would form a hindrance to entering in a gale.

A vessel entering the harbor in a southeast gale would have to go in before it, and would need ample channel width. If the north jetty be prolonged comparatively smooth water will be reached soon after the present end of the south jetty is passed. It is consequently unnecessary to dredge the entrance to a greater width than the proposed channel width (600 feet) inside of this point.

As the new naval station located at Charleston is about being begun, the importance of Charleston Harbor to the general public is greatly enhanced. A good safe entrance in bad weather for naval vessels is very important.

For the reasons given in this report, I think that Charleston is the best harbor on this part of the coast to be improved as a harbor of refuge, and I recommend the following work:

1. To extend the north jetty in the direction of its present outer end about 10,000 feet, or to 28 feet depth of water.
2. To dredge the entrance between this proposed prolongation of the north jetty and the line of the south jetty extended (about 2,800 feet wide) to the depth of 28 feet at mean low water.
3. To dredge beyond the proposed end of the jetty, if a survey made in the future should show that this is necessary, to secure 28 feet at mean low water over the area just beyond this proposed end. A depth somewhat greater than that of the proposed channel is necessary to give vessels entering in a storm some allowance for "send" until smooth water is reached.

Very respectfully, your obedient servant,

James P. Allen,
Assistant Engineer.

Capt. James C. Sanford,
Corps of Engineers, U. S. A.

LETTER OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

United States Engineer Office,
Charleston, S. C., April 15, 1903.

General: Referring to my report dated April 9, 1903, on preliminary examination of Charleston Harbor, South Carolina, "to ascertain the advisability of extending the jetties with a view to providing a harbor of refuge," I have the honor to submit inclosed as an appendix thereto copy of letter dated January 4, 1902, of Mr. George B. Edwards, vice-president, Charleston Chamber of Commerce, to the Hon. Theodore E. Burton, House of Representatives, Washington,

D. C., with inclosed copy of petition asking that the jetties at Charleston be extended. At the date of my above report these papers could not be furnished on account of the absence of Mr. Edwards.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

LETTER OF THE CHARLESTON (S. C.) CHAMBER OF COMMERCE.

CHARLESTON CHAMBER OF COMMERCE,
Charleston, S. C., January 4, 1902.

DEAR SIR: Referring to the inclosed, we ask the privilege of endeavoring to make clear to you the reasons why this harbor of refuge is urgent. We have been urged to take action in this matter by many sea captains, vessel owners, and representatives of marine insurance companies. Until within recent years harbors of refuge were not so necessary, for in hurricanes vessels would put out to sea, and as they held small cargoes they were able to ride out the storm in comparative safety, and after the hurricane was over they could be brought safely into harbor. These conditions are now changed; vessels and cargoes are much larger. It is not possible to build vessels strong enough to withstand the force of large cargoes of lumber, coal, phosphate rock, railroad iron, or any other of the many heavy cargoes during a hurricane, and the consequence is that not only are the vessels and cargoes completely lost, but often the lives of the entire crew.

A survey for this harbor of refuge and a 30-foot channel at the entrance to Charleston Harbor was provided for in the river and harbor bill which failed last session (Senate amendment 292), but the resolution recently introduced by Congressman Elliott and referred to your committee provides only for a report on the cost of the harbor of refuge. We have separated the project for the 30-foot channel, as that being an improvement especially for Charleston it should wait and take its regular course (provision for survey going into the coming river and harbor bill), but as the harbor of refuge is an improvement in the interest of the entire coastwise shipping along the South Atlantic and Gulf coasts, we ask that you will take favorable action on the resolution for a report as to cost of harbor of refuge and make appropriation for the work in the coming river and harbor bill.

It is really a great public improvement, not for any particular locality. If this harbor of refuge has to take its regular course, two years will probably elapse before another river and harbor bill will be passed, and in the time lost by such delay, not only would there be hundreds of thousands of dollars of property destroyed, but many valuable lives sacrificed.

Yours, very truly,

GEO. B. EDWARDS,
Vice-President.

Hon. THEODORE E. BURTON,
House of Representatives, Washington, D. C.

PETITION OF VARIOUS STEAMSHIP LINES AND MARINE UNDERWRITERS.

The Senate and House of Representatives of the United States:

The undersigned, West India coastwise steamship lines and marine underwriters, would respectfully call the attention of Congress to the pressing need of a harbor of refuge south of Cape Hatteras into which coastwise vessels may run for shelter when overtaken by the violent hurricanes which originate in West Indian waters and pass up the South Atlantic coast every autumn.

The extending of the project for the improvement of Charleston, S. C., harbor seems to offer the quickest means of obtaining such a refuge for coastwise shipping. The report of the United States engineers submitted at the last session of Congress expresses the opinion that in order to secure the desired depth of water at the entrance to Charleston Harbor an effort be first made to secure such depth by means of dredging, which dredging would be necessary in any event; and further that it possibly will be necessary to extend the jetties in order to maintain the projected depth of water at the entrance to that harbor.

In view of this your petitioners would respectfully urge that the jetties at Charleston Harbor be extended at once so as to afford a safe and easy entrance for vessels that may be compelled to seek safety from the annual autumnal West Indian hurricanes, and that the work be completed in the shortest possible time, as the need for such a place of safety for vessels is most urgent.

And your petitioners will ever pray, etc.

The Clyde Steamship Company; Atlas Steamship Company, Pim, Forward & Kellock, agents; Busk & Jevons; Bacon Steamship Line; The New York and Cuba Mail Steamship Company; Munson Steamship Line; Trinidad Shipping and Trading Company, Limited; Mutual Steamship Line; The Southern Pacific Company; The Atlantic Mutual Insurance Company; West Coast Steamship Company; The United States Shipping Company; J. H. Winchester & Co.; Boston Insurance Company; British and Foreign Marine Insurance Company, Limited (American and Foreign); The Cameron Steamship Line (J. S. Cameron); The Tweedie Line; Funch, Edys & Co.; Wm. R. Grace & Co.; Booth Steamship Company, Limited; The New York and Porto Rico Steamship Company; Quebec Steamship Company, Limited; The Bahamas Steamship Company, Limited; The Cromwell Steamship Company; Panama Railroad and Steamship Line; Flint, Eddy & Co.; Union-Clan Line; Thames and Mersey Marine Insurance Company, Limited; Mannheim Insurance Company; Reliance Marine Insurance Company, Limited.

N 15.

PRELIMINARY EXAMINATION OF EDISTO RIVER, SOUTH CAROLINA, FROM THE MOUTH TO THE AIKEN AND EDGEFIELD LINE.

[Printed in House Doc. No. 173, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated April 7, 1903, by Capt. J. C. Sanford, Corps of Engineers, on preliminary examination of Edisto River, South Carolina, from the mouth to the Aiken and Edgefield line, authorized by the river and harbor act approved June 13, 1902.

This stream and its forks have heretofore been improved by the United States with a view to providing facilities for rafting timber, but work was discontinued in 1896 after the timber marketable at that time had been taken out. Further improvement of the stream would be almost entirely for the benefit of such navigation, and Captain Sanford states in his report that if it is the policy of the Government to improve streams for rafting purposes alone, then he considers this stream worthy of improvement to the extent of removing the worst obstructions. The division engineer, Lieut. Col. James B. Quinn, Corps of Engineers, forwards the report with favorable recommendation.

This report has been reviewed by the Board of Engineers for Rivers and Harbors, in pursuance of the provisions of sections 3 and 14 of the above-mentioned act, and a public hearing has been held at which interested parties failed to avail themselves of the opportunity to be heard in support of the proposed improvement. In view of the facts recited in its report of July 11, 1903, the Board expresses the opinion that it is not advisable for the United States to undertake the further improvement of this river.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., April 7, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of the Edisto River, South Carolina, from the mouth to the Aiken and Edgefield line, made in accordance with the requirements of the river and harbor act approved June 13, 1902:

The Edisto River is formed by the junction of the North and South forks in the south-central part of South Carolina, the two forks rising quite close to one another in the western part of the State and not far from the above-mentioned Aiken and Edgefield line. The general course of the river, as well as of the North and South forks, is southeast. It empties into the Atlantic Ocean near the mouth of St. Helena Sound. Of the two forks, the South Fork is somewhat the larger.

This river was examined in 1880 under Col. Q. A. Gillmore, Corps of Engineers. His full report will be found on pages 1138–1143, Annual Report of the Chief of Engineers for 1881. This examination covered the river from Guignards Landing, on the South Fork, to the mouth of the river, a distance determined to be about 260 miles. As Guignards Landing is about 45 miles, by the river, below the Aiken and Edgefield line, the stretch of river under consideration is something over 300 miles in length. The first appropriation of $8,000 was made for the improvement of Edisto River, under Colonel Gillmore's project, in 1882, and the full amount of his estimate, $33,385, was ultimately appropriated. All of this was expended in the improvement of the river from Guignards Landing to the mouth, except a small balance of $282.35, which was redeposited to the credit of the Treasurer of the United States June 24, 1896, and the sum of $2,500, which was spent on the North Fork, as required by the river and harbor act of September 19, 1890. In the Annual Report for 1896, Capt. (now Maj.) Frederic V. Abbot, Corps of Engineers, reported as follows:

> *Remarks.*—No further work will be done on this river, and no further annual reports will be submitted. The improvement has been successful, inasmuch as the desired result has been attained for less than the estimated cost. Maintenance is not recommended, as the work done has allowed the available timber to come out, and there is nothing else of value left on the river.

No steamboat or flatboat navigation was developed by the improvement, and during the progress of the work it became apparent that the rafting of timber and lumber was the only interest that warranted the improvement of the stream. This work of improvement consisted of the removal of snags, trees, logs, and stumps from the channel and overhanging trees from the banks, the opening of some of the "sucks" or natural cut-offs across bends, alluded to in Colonel Gillmore's report, and the closing of others which had not already advanced too far to permit of doing so successfully.

The improvement permitted rafting to be done at a much lower stage of water than would have been possible had nothing been done, and doubtless stimulated the output of yellow-pine timber and lumber until practically all of this along the improved portion had been cut.

A new business has recently sprung up on Edisto River, due to the fact that a market has opened for other kinds of pine, of which there is a large supply near the river. This will last, from present market indications, about ten years. The swamp pine and other classes of pine are now in considerable demand, which kinds, although vastly inferior to the yellow pine, are not only marketable but bring fair prices. There is, consequently, considerable activity on Edisto River.

An examination was made of portions of the river by Assistant Engineer James P. Allen, in August, 1902. His report is appended. This examination had in view the determination of the physical features of that portion of the river above Guignards Landing and the present condition of the river below, which had been formerly improved. That portion of the river above Cooks bridge is too small to warrant improvement even for the rafting interest. It appears that there is still some yellow-pine timber in the northern part of Aiken County, but not in sufficient quantities to warrant improving so small a stream, even to the extent that such improvement might be possible. This country is well intersected by railroads, but freight rates are not low enough to induce the cutting of the timber generally. That portion of the river between Cooks bridge and Guignards Landing might be cleared at a smaller cost per mile than the lower portion actually did cost, as the banks are largely covered with brush and smaller trees; but as it has never been cleared before, the cost per mile of clearing the entire river at present would be about uniform.

If it is the policy of the Government to continue the improvement of streams for rafting purposes alone, this river is considered worthy of improvement to the extent of removing the worst obstructions. A survey would cost about $1,500. It is not considered necessary, as an estimate can be made from available data.

Commercial statistics and an estimate of the quantity of timber which would probably come to the river if it was cleared sufficiently are submitted herewith. These were prepared by Mr. J. D. Ackerman, who superintended a large part of the work formerly done by the United States and is familiar with a large portion of the Edisto River.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 13, 1903.

Respectfully submitted to the Chief of Engineers. United States Army.

Since rafts have been decided by the United States courts to have all the legal characteristics of vessels, so far as navigation is concerned, and since it has been found advantageous for the Government to encourage such navigation, I respectfully recommend that, inasmuch as the interests of navigation appear to warrant the improvement of the Edisto River for rafting purposes between Cooks bridge and the lower limit of previous improvements, an estimate of the cost of improvement by the removal of snags, stumps, overhanging trees, and sunken rafts be made, based upon the present available data.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 18, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of "Edisto River, from the mouth to the Aiken and Edgefield line," the indorsement of the division engineer thereon, and all other data available. On June 17, 1903, a committee of the Board held a public hearing at Charleston, S. C., of which due notice was given and at which interested parties failed to avail themselves of an opportunity to be heard in support of the proposed improvement.

The Edisto River and its South Fork were cleared of snags from Guignards Landing to its mouth, a distance of 260 miles, previous to June 30, 1895. This improvement facilitated the removal of timber then marketable.

Recently a market has been established for timber that was comparatively valueless a few years ago, and it is reported that several hundred million feet might now be profitably cut upon the upper portion of this river. There is no prospect of the development of steamboat navigation. The lower portion of the river is useful for logging purposes in its present condition.

The Aiken and Edgefield line, South Carolina, is about 45 miles above the upper limit of the former improvement. The upper portion of this 45 miles of river is too small to warrant consideration even for rafting purposes.

Having in mind that to facilitate the removal of the remaining timber upon the upper Edisto is a matter of at least doubtful public policy; that no improvement of this stream at reasonable cost would be of a permanent nature; that no general navigation is expected to result from any improvements proposed; that the greater portion of the good timber has probably already been removed; and that the lower portion of the river is still useful for logging purposes, the Board is of opinion that it is not advisable for the United States to undertake the further improvement of this river.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. JAMES P. ALLEN, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., August 22, 1902.

CAPTAIN: I have the honor to submit the following report of an examination of Edisto River, South Carolina. The services of Mr. J. D. Ackerman, an expert lumberman, were secured. Mr. Ackerman had moreover been employed as overseer during the progress of work on the river from about 1884 to 1896. He visited the upper portion of the river before I did, going to Ridge Springs, in Saluda County, and driving from that point to Mims bridge, which is only a short distance below a rock shoal. The river at Mims bridge is about 20 feet wide, very shallow, and much hedged in by brush. He visited other points lower down and arranged to go over the ground with me a day or so later. On August 12 we went together to Aiken and drove out to Merritts bridge, 8 miles below Mims bridge. A heavy rain on the day before had put the river up and it was about 40 feet wide at the bridge with a current of 2 feet per second and a central depth of about 8 feet. It was about 3.5 feet higher than when seen by Mr. Ackerman a few days before.

At that time it was only 20 feet wide and did not carry more than one-sixth as much water. The swamp on the west side was about one-quarter of a mile wide, and a clay hill rises from the bridge on the east side. The swamp growth was small and practically valueless. There was some scattered yellow pine timber along the road from Aiken to this bridge. Not being satisfied that the river was too small to warrant discontinuing the examination of the higher portion, we drove along up the bank to Eorgles bridge, about 5 miles higher up. At this point the river was only about 30 feet wide and barely 3 feet deep, although the stage was about 2 feet higher than when Mr. Ackerman saw it a few days before. At low water it is about 20 feet wide and less than 1 foot deep. Between these bridges at least two considerable tributaries come in, one on the west and one on the east side. It is stated that years ago some lumber was taken out from this point on the river. I was informed that not very far above this bridge there is a rocky shoal. My examination was carried no farther up.

About 5 miles by land below Merritts bridge is Cooks bridge, which was visited by Mr. Ackerman on August 8. From this point the river is better, and it is said that some rafting has been done below within the last three years. This is the highest point upon the river to which it seems reasonable to extend any improvement by the Government. From this bridge to Guignards Landing is about 15 miles by land. In driving from Eorgles bridge back to Aiken on August 12 we crossed Shaws

Creek. This is a tributary of Edisto River, which enters the river below Cooks bridge and is apparently about as large a stream as the Edisto at Eorgles bridge. August 13 we went down to Bamburg and drove into the river at New bridge. At this point the river is about 75 feet wide. This is within the portion which was cleared under Major Abbot. We could see obstructions in the river both above and below the bridge. There is a considerable width of swamp here. We then drove to Wrights Ditch, where we secured a boat and paddled over a portion of the stream. The river appeared to be about 3 feet above low-water stage. A short distance below where we started there was a tree entirely across, so that we had to pull the boat under the tree and step across. There were quite a number of overhangs; also snags, stumps, and trees in the channel. We also saw an old sunken raft. We arrived at Hopps Turn-hole in a little more than an hour, where we found our conveyance awaiting us. The distance passed over was about 5 or 6 miles by the river. There were 7 or 8 bad obstructions per mile in the channel, so far as could be seen at that stage, besides leaning trees on the banks, of which there were a great number.

We returned to Bamburg from this point and then went by train to St. Georges, where we spent the night. August 14 we drove down to the river and got a boat near Taff Rumph Suck. This was a suck which had been opened by the Government some years ago. It is much wider now than it was when work was closed, having been washed out by the rapid current through the suck. The current is still rapid, but not so much so as formerly, and rafts find little trouble here. The Old bend of the river is rapidly closing up. We got another boat lower down and paddled over at least six miles of the river from Tar Landing to Hatters Bluff. In the straight portions of the river there are comparatively few obstructions, but in the bends there are a good many. This is what would naturally be expected, for in the bends we have cutting banks and consequently falling trees. At Brothers Creek there is another suck which has opened by natural process, and the current through it is very rapid. A good deal of work is needed at this place.

There is considerable activity exhibited on the lower portion of the river. We passed several landings where lumber and cross-ties were being shipped. While there is no longer any yellow pine on this portion of the river, there is enough of other qualities to supply the demands of the market for ten years to come.

The Edisto is a very good rafting river, but it is useless to calculate upon improving it for steamboats or flatboats. There is no business to warrant any expectation that boats would be used on this river. The country tributary to the river is well supplied with railroads. There are certain shoals in the river, notably those near Parkers Ferry in the lower portion, which would be difficult to improve, and which, unless they were improved, would practically block navigation above them except at high stages of the river.

The following facts and commercial statistics have been prepared by Mr. Ackerman, who lives at Cottageville, near the river, and is well fitted to secure and tabulate these data.

Very respectfully, your obedient servant,

James P. Allen,
Assistant Engineer.

Capt. J. C. Sanford,
Corps of Engineers, U. S. Army.

REPORTS OF MR. J. D. ACKERMAN.

Cottageville, S. C., *August 20, 1902.*

Sir: I beg leave to say in the examination of the Edisto River I find that the main river near the Saluda County line is very narrow and shoal at low water, not more than 6 to 12 inches at mean low water. This condition is from the shoals above Mims bridge to Merritts bridge. From Merritts to Colemans bridge the condition is somewhat changed, but not materially. All along the banks are overhanging trees, many reaching clear across the stream, and in many places obstructions from trees previously fallen in. From Colemans bridge rafting has been going on from time to time. The streams are partly cleared. With some difficulty during good stages of water, they can use it for rafting down to the Edisto bridge. From the Edisto, lumber can be rafted very well with fair stages of water, say 3 feet above low water, all along the river down to Jacksonboro. There are many obstructions, such as trees washed up and blown into the river, which very much obstruct the channel at low water.

I consider that this part of the river is very important to be improved, because then lumbermen can get out their material almost at any stage of water, which would cause an advanced price for all timber along the line of the river. It could be handled at short notice, getting better prices, as this would be a guarantee of quick delivery. It would also lessen the cost of transportation.

There are three bridges across the river below Cannady. Opposite St. Georges I find the bridge (Stokes or Dorchester) in good condition, no draw, with raft span 58 feet wide; Sullivans bridge in fair condition, draw, with raft span 48 feet; bridge at McLouds, owned by the Georgia Chemical Company, for freighting phosphates by steam, in good condition, with draw span 40 feet.

Very respectfully, your obedient servant,

J. D. Ackerman.

Mr. James P. Allen,
United States Engineer Office.

Cottageville, S. C., *August 19, 1902.*

Sir: I beg to make the following report:

By as careful estimate as I can make there are over 200,000,000 feet, board measure, of pine lumber between Jacksonboro and Edisto station. There are over 100,000,000 feet on the South Fork of the Edisto River, and, I suppose, on the North Fork you will find about the same amount. There are also about 100,000,000 feet of cypress below Edisto station, and there is more than that amount above the Edisto bridge. This estimate for timber for all purposes—hewing, sawing, cross-ties, shingles, etc.—is based on timber within 6 miles of the river. I find quite a lot of logs and lumber getting out on the lower river at this time. The market has just opened within the last three years for swamp pine timber, which is accessible to the Edisto River. There is enough timber to continue the business at the present demand for at least eight or ten years.

Following is the commerce passing over the Edisto River during the calendar year 1901: 22,000,000 feet, board measure, lumber; 10,000,000 feet, board measure, timber and logs; total, 32,000,000 feet, board measure, valued at $7 per M in Charleston, S. C., $224,000.

There is not much of any other products—not enough to be reported. The above information is from the best authorities along the river and in Charleston.

Respectfully submitted.

J. D. Ackerman.

Mr. James P. Allen,
United States Engineer Office.

N 16.

PRELIMINARY EXAMINATION AND SURVEY OF GEORGETOWN HARBOR, SOUTH CAROLINA, INCLUDING SAMPIT RIVER, AND THENCE TO AND INCLUDING THE OCEAN ENTRANCE TO WINYAH BAY.

[Printed in House Doc. No. 398, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, January 8, 1904.

Sir: I have the honor to submit herewith reports, dated April 8 and September 26, 1903, with map,[a] by Capt. J. C. Sanford and Capt. G. P. Howell, Corps of Engineers, on preliminary examination and survey, respectively, of Georgetown Harbor, with a view of obtaining a channel with a navigable depth of 18 feet at mean low water, and a width of 400 feet, or such width as may be necessary or practicable, from a point 1 mile above the limits of the city of Georgetown, in Sampit River, to the ocean entrance to Winyah Bay, South Carolina, as far seaward as may be necessary to form a project to secure said depth. These reports are made in compliance with a requirement in the river and harbor act of June 13, 1902, and attention is invited to the views thereon by Lieut. Col. James B. Quinn, Corps of Engineers, division engineer.

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[a] Not reprinted; printed in House Document No. 398, Fifty-eighth Congress, second session.

This locality is now under improvement by the United States, with a view to providing a depth of 15 feet at mean low tide by means of jetties and dredging, and in the opinion of the district and division engineers the further improvement proposed is worthy of being undertaken by the General Government. Captain Howell discusses in his report plans for improvement by way of two routes, designated as the eastern channel and the western channel, respectively, but he prefers the route via the eastern channel because less expensive, and he presents a detailed estimate of the cost of providing an 18-foot channel, 400 feet wide, by dredging and jetty contruction; but the selection of the eastern channel for improvement is not approved by the division engineer, who recommends that the western channel be improved, and that training dikes be constructed as proposed by him.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors, under the provisions of sections 3 and 14 of the above-mentioned act, and reports thereon are made in indorsements of July 7 and December 22, 1903. The existing project for improvement is summarized in the Board's report of July 7, and the Board recommends in its report of December 22 that this project be modified so as to provide for an 18-foot channel, as proposed by the act, at an estimated cost of $650,000, inclusive of the balance of funds on hand, the improvement to be made by way of the western channel and to be accomplished by means of dredging and the construction of a training wall to deflect the current into the concave bend along the western shore.

I concur in the views of the Board.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

PRELIMINARY EXAMINATION OF GEORGETOWN HARBOR, SOUTH CAROLINA, INCLUDING SAMPIT RIVER, AND THENCE TO AND INCLUDING THE OCEAN ENTRANCE TO WINYAH BAY.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., April 8, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of Georgetown Harbor, with a view of obtaining a channel with a navigable depth of 18 feet at mean low water and a width of 400 feet, or such width as may be necessary or practicable, from a point 1 mile above the limits of the city of Georgetown, in Sampit River, to the ocean entrance of Winyah Bay, South Carolina, as far seaward as may be necessary to form a project to secure said depth, the examination being made in accordance with the requirements of the river and harbor act approved June 13, 1902:

The city of Georgetown is situated on Sampit River, less than a mile above its mouth, in Winyah Bay. The lower portion of the Sampit River has hitherto been known as Georgetown Harbor. The above-stated limits of this preliminary examination, however, include also nearly the entire length of Winyah Bay, as well as its ocean entrance, which is between North and South islands. As will be described hereafter, this entrance has recently been improved by two jetties springing from these two islands, respectively, and known as the north and the south jetty. The distance from Georgetown to the gorge of the entrance between the islands is about 12 miles, and to the outer end of the south jetty, which is the longer of the two, over 16 miles.

The Sampit River at Georgetown is somewhat over 400 feet wide, the channel being over 18 feet deep at mean low water along the upper half of the city front, and having a least depth of 15.9 feet along the lower half. Below Georgetown the river channel has a depth generally less than 18 feet, and just outside the mouth in Winyah Bay there was a particularly troublesome shoal on which the original depth was 9 feet (a narrow channel 12 feet deep has since been dredged through this shoal). Except for this shoal about 13 feet could be carried from Georgetown to the gorge at the mouth of the bay. The original depth across the ocean bar ranged from 7 to 9 feet.

Winyah Bay has an area of about 25 square miles. It receives the waters of Great Pedee, Waccamaw, and Sampit rivers. Due to the sediment brought down by the rivers it has large shoal areas. Over one-third of the length of the channel from Sampit River to the gorge has a depth of less than 18 feet, the ruling depth being about 12½ feet except across the shoals just outside the mouth of the Sampit, where the depth is about 12 feet.

A project adopted in 1889 for the improvement of the ocean entrance to the bay provided for constructing two jetties, by which it was expected to secure a depth of 15 feet across the bar. By the river and harbor act of June 3, 1896, this project was placed under the continuing-contract system, its completion being authorized at a cost of not exceeding $2,016,250, exclusive of amounts appropriated in former years, which aggregated $428,750. To assist the action of the jetties, the seagoing suction dredge *Winyah Bay* was constructed in 1897–98, and has since been operated on the work, though not continuously. The jetties have been carried out to and beyond the originally projected length, but have not been given the full section originally thought necessary, as it had become evident that the required depth could be obtained by a less expensive section aided by the dredge.

The contract for constructing the jetties was terminated in November, 1902. The entrance channel has now the project depth of 15 feet, but is somewhat narrow in places. It is expected that the jetties, aided by dredging, will produce a depth of at least 18 feet.

As shown by the appended report of Assistant Engineer Reid Whitford, the commerce of Georgetown has greatly increased, due to the improvement of the ocean entrance. Enormous lumber mills have been built at Georgetown by the Atlantic Coast Lumber Company, the output of the mills being shipped north by steamships and sailing vessels. The following table of commercial statistics for the year

1901, is taken from the Annual Report Chief of Engineers for 1902, page 1156:

Articles.	Tons.	Value.
OUTWARD FREIGHTS.		
Naval stores	19,334	$367,932
Cotton	3,525	564,000
Rice, rough and clean	9,360	580,467
Lumber, shingles, and cross-ties	171,094	1,090,507
Fish, game, and vegetables	1,900	190,000
Miscellaneous	1,243	1,665,000
Total	206,456	4,457,906
INWARD FREIGHTS.		
Miscellaneous	41,533	4,000,000
Grand total	247,989	8,457,906

The river and harbor act approved June 13, 1902, contained the following authorization:

> Winyah Bay, South Carolina: The dredge or dredges employed in connection with the work of improvement of the entrance to Winyah Bay, and such other dredges owned or controlled by the Government as are used on Winyah Bay river systems and canals, may be used in dredging the shoal places between the entrance and the city of Georgetown, South Carolina, over which the least channel depths may at any time be less than at the entrance of the bay; and any expense so caused shall be paid from amounts appropriated or that may be appropriated for said Winyah Bay: *Provided,* That the expense of said dredging added to that of improving the entrance to said bay shall not exceed the total amount appropriated and authorized to be appropriated by act of June third, eighteen hundred and ninety-six.

The contract for jetty construction having now been terminated, it can be seen that, after deducting the estimated cost of protecting the shore end of the south jetty by works already approved, there will be available for dredging under the above authorization over $400,000. This will, in my opinion, much more than suffice for obtaining an 18-foot channel, 400 feet wide, from Georgetown to the ocean. It is possible that the jetties may settle to a greater extent than expected, rendering it desirable for economical maintenance of the channel to expend a portion of this balance in raising them; but no estimate of the cost of this can now be made. In any event, I believe it will be possible with the above authorization to obtain an 18-foot depth with a width approximating 400 feet, and would not recommend entering at this time upon a new project.

Georgetown Harbor is, in my opinion, worthy of improvement at this time to the extent of securing an 18-foot depth by dredging under the above authorization of the act of June 13, 1902, with such width of channel, not exceeding about 400 feet, as the funds available will permit.

No survey is necessary, a survey of the bay in connection with work to be done under the above authorization having recently been made. The map of this survey is now nearly completed. From the results of the survey it can be determined whether the 18-foot channel should be dredged in the present eastern channel (described in Assistant Engineer Whitford's appended report) or in the western channel. The location should, in my opinion, be chosen where the cost of securing and maintaining the channel will be the least.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 17, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

Winyah Bay is scored with many channels, none of which appear to present any indications of permanency. If they could be combined in one and prevented from straying, there is no reason to doubt that a very satisfactory channel, of even greater depth than that desired, could be obtained. This result would involve the construction of brush dams at the head of Rabbit Island and at Frazier Point, so as to confine the water to the west channel, which, for the convenience of commerce, is the most desirable channel to improve, and, under the above conditions, would be the easiest to maintain.

I am doubtful about the feasibility of maintaining constantly an 18-foot channel, as proposed, by dredging, and I believe the object of the examination contemplates more than temporary expediency.

The cost of maintaining the jetties can not be stated, and yet the preservation of the jetties is of the first consequence in securing and maintaining an increased channel depth between them.

I do not approve of leaving the subject in a tentative shape, and believe the officer in charge of the improvement should be instructed to prepare an estimate which would promise definite results.

I concur with the district officer that the locality is worthy of improvement.

JAMES B. QUINN,
Lt. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 25, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 7, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer and the indorsement of the division engineer thereon, in reference to the preliminary examination ordered by the river and harbor act of June 13, 1902, of—

> Georgetown Harbor, with a view to obtaining a channel with a navigable depth of eighteen feet at mean low water, and a width of four hundred feet, or such width as may be necessary or practicable, from a point one mile above the limits of the city of Georgetown, in Sampit River, to the ocean entrance of Winyaw Bay, South Carolina, as far seaward as may be necessary to form a project to secure said depth.

On June 18, 1903, a committee of the Board inspected the locality and held a public hearing at which interested parties were given opportunity to express their views.

Georgetown, S. C., is situated upon Sampit River, less than a mile above its mouth, in Winyah Bay. From Georgetown to the gorge of Winyah Bay entrance is about 12 miles.

The project for the improvement of Winyah Bay contemplates a depth at the entrance of 15 feet at mean low tide, to be secured by means of jetties and dredging, and the river and harbor act approved June 13, 1902, authorized the use of available Government dredges in removing shoals between the sea entrance and Georgetown—

> over which the least channel depths may at any time be less than at the entrance of the bay; * * * *Provided*, That the expense of said dredging added to that of improving the entrance to said bay shall not exceed the total amount appropriated and authorized to be appropriated by act of June third, eighteen hundred and ninety-six.

At the sea entrance there is now the projected depth of 15 feet, and it is expected that the jetties, aided by dredging, will produce a depth of at least 18 feet. More than one-third of the distance between Georgetown and the jetties has a depth of less than 18 feet, the controlling depth being about 12 feet.

It is the opinion of the district officer that the balance from amounts heretofore appropriated or authorized will suffice to produce a channel 400 feet wide and 18 feet deep from Georgetown to the sea.

The commerce of Georgetown is large and increasing, being reported as 247,989 tons, valued at $8,457,906, in 1901. The Winyah Bay system of navigable streams embraces nearly 800 miles of waterways, and affords cheap transportation routes from interior points throughout much of the eastern portion of South Carolina to the seaboard at Georgetown.

The Board is of opinion that it is advisable formally to modify the project for the improvement of Winyah Bay so as to provide for an 18-foot channel, and recommends that the district officer be directed to prepare a project and estimate of cost of an 18-foot channel 400 feet wide in the bay, and of suitable width in Sampit River, from a point 1 mile above the limits of the city of Georgetown to the ocean entrance of Winyah Bay, South Carolina, as far seaward as may be necessary to secure said depth.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
July 11, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Georgetown Harbor, South Carolina, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors, in the preceding indorsement, I recommend that the local officer be directed to prepare the project and estimate of cost recommended by the Board.

A. MACKENZIE,
Acting Chief of Engineers.

[Fifth indorsement.]

WAR DEPARTMENT,
July 14, 1903.

Approved as recommended by the Acting Chief of Engineers.

WM. CARY SANGER,
Acting Secretary of War.

[Sixth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 7, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with project and estimate, as recommended, attention being invited to the fact that the balance of present contract authorization would not be applicable to the new project, except in the item of dredging, as permitted by the river and harbor act of 1902, without special action by Congress, and, further, that this balance may be materially reduced before such action will be taken should Congress give the matter favorable consideration.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Seventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 22, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the accompanying report on a survey with a view to a project and estimate for a channel 18 feet deep from a point on the Sampit River 1 mile above the limits of the city of Georgetown, S. C., to the ocean entrance of Winyah Bay of suitable width in the river and 400 feet wide elsewhere.

The district officer estimates the cost of dredging such a channel, following the western shore of Winyah Bay, at $520,000. For a part of this channel he recommends a less expensive location near the axis of the bay. Navigators prefer the western route, the division engineer advocates it, and the Board believes that its greater cost is more than offset by its superior advantages. In addition to the estimate for dredging there are submitted estimates of $130,000 for a training wall, to deflect the current into the concave bend along the western shore, and of $325,000 for building up the Winyah Bay jetties. The last item of work would be no more necesary in connection with the 18-foot project now contemplated than as a part of the existing project. It is believed by the Board that the raising of the jetties is not immediately necessary, and need not now be provided for.

The Board renews its recommendation, as expressed in third indorsement hereon, that the project for the improvement of Winyah Bay be modified so as to provide for an 18-foot channel from a point 1 mile above the limits of the city of Georgetown, in Sampit River, to the ocean entrance of Winyah Bay, South Carolina, as far seaward as may be necessary to form a project to secure said depth, in accordance with the project above described, at an estimated cost of $650,000, inclusive of the balance on hand.

For the board:

A. M. Miller,
Lieut. Col., Corps of Engineers,
Senior Member Present.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

United States Engineer Office,
Georgetown, S. C., August 18, 1902.

Captain: In compliance with instructions contained in your letter of July 31, 1902, I have the honor to make the following report on the preliminary examination of Georgetown Harbor, South Carolina, as provided for in the river and harbor act of June 13, 1902, which specified that the examination was to be made "with a view of obtaining a channel with a navigable depth of 18 feet at mean low water, and a width of 400 feet, or such width as may be necessary or practicable, from a point 1 mile above the limits of the city of Georgetown, in Sampit River, to the ocean entrance of Winyah Bay, South Carolina, as far seaward as may be necessary to form a project to secure said depth."

This, therefore, embraces practically all of Winyah Bay, from its sea entrance, and a portion of the Sampit River to a point above the wharves of the city of Georgetown, a distance of probably 18 miles.

Winyah Bay is a catch-basin, so to speak, for large volumes of fresh water brought down by many miles of tributary rivers, and as this water carries sand and silt in varying quantities, shoals are liable to be formed in the bay from deposits of these materials. When these up-country rivers are in freshet Winyah Bay is entirely fresh at low water.

The Sampit River, on which Georgetown is situated and less than a mile from its mouth, is nothing more than a tide-water arm of Winyah Bay and reaches a comparatively short distance in the direction of the Santee River. The worst place for navigation on the Sampit, in the vicinity of Georgetown, is immediately at its mouth where it joins Winyah Bay. Here there was originally a shoal, somewhat less than a half mile in length, on which there was a controlling depth of about 10 feet at mean low water.

Under a survey and appropriation made by the United States Government, between the years, approximately, 1882 and 1886, dredging operations were carried on here to a depth of 12 feet and width of 200 feet at mean low water. As funds were not provided to maintain the dredged channel it has probably filled to a certain extent. Further than this, no attempt has been made by the General Government to deepen the shoals in Georgetown Harbor, of which there are three others, two being in the eastern channel, between beacons 1, 3, and 5, and one in the western channel, between Mosquito Creek and beacon No. 5, except that under authority granted by a previous river and harbor act the suction dredge belonging to Winyah Bay did a little dredging on shoal at beacon No. 1. This did not amount to much, as it was only allowable for the dredge to work on the shoals in the upper bay when the weather was too rough for dredging at the sea entrance.

The jetties which are in course of construction at the sea entrance to Georgetown Harbor, under a project to provide 15 feet depth at mean low water there, are nearing completion. The depth reported by the survey in June last was 13.9 feet at mean low water. The jetties under the present contract are being built only to partial dimensions, and it may in time be necessary, in order to maintain an 18-foot mean low-water channel at the sea entrance to the harbor, to increase the widths and heights of the jetties, requiring considerable quantities of stone to do so.

The depths now on the upper shoals are approximately as follows at mean low water: Mouth of Sampit River, 13 feet; between beacons Nos. 3 and 5, eastern channel, 12.6 feet; between beacons Nos. 1 and 3, 12.5 feet; average depth in the western channel, 10.6 feet.

These depths are said to be sufficient to fill the present demands of commerce in Georgetown Harbor. The delay caused the ships by the existence of these shoals obstructs the rapid development and expansion of the commerce of the port. As the ships leave Georgetown on low water to meet the rising tide on the outer sea bar, it is evident that the depth in the upper harbor is insufficient, and, as a matter of fact, everyone agrees that 15 feet at mean low water, under which the present project is carried on, is not depth enough to accommodate the large steamships plying in and out of the port. So far as is known, this is the first examination which has ever been made over the area designated above by the United States Government looking to the removal of the shoals of the upper harbor simultaneously with the deepening of the sea bar at the entrance.

COMMERCE.

Mr. John I. Hazard, a prominent business man of this place, for the fiscal year ending June 30, 1886, reported the value of the commerce of Georgetown Harbor to have been $3,757,273.05, which was carried on by about 30 sea-going vessels of about 300 tons (average) each. There were also reported 7 steamers engaged in traffic, some of them on the rivers tributary to Winyah Bay, and the others engaged on the route between Charleston and Georgetown. Mr. Hazard said at the time that he had used considerable care in collecting the foregoing figures, so that they might be as reliable as possible.

The present yearly commerce of Georgetown Harbor is said to be about 247,989 tons, valued at $8,457,906, and is carried on by the list of vessels hereto attached. These commercial figures were furnished by Mr. W. D. Morgan, mayor of Georgetown, who consumed months in collecting them from various sources, including shippers, freight offices, and the like. Mr. Morgan has had long and special experience in this character of work, in keeping an account and watching carefully the commercial development of Georgetown, and his statement is believed to be as correct as it is possible to obtain it unless a daily record was made of all the shipments in and out of the port, including freights carried on pull boats, small sailing vessels, and craft of like description, of which no account is kept by anyone.

From my own personal knowledge of the value of the Georgetown Harbor commerce at present, it is conscientiously believed that Mr. Morgan has not overestimated the figures given above, but that if anything it is undervalued. It shows an increase of about 25 per cent over the preceding year. This need not create any surprise when it is remembered that the United States, by the improvement of the outer sea entrance, has deepened the water there. Together with this impetus which has been given to shipping, the Atlantic Coast Lumber Company—a huge affair of the kind—established a milling plant in Georgetown, said to be second to none, not only in the United States, but in the world. The shipments from this plant necessarily increase the commerce of the port. Aside from this, the general prosperous condition of the country which has existed for the past several years has greatly increased the shipment of freights in Georgetown Harbor from its many miles of tributary rivers.

PROSPECTIVE COMMERCE.

As to the prospective commerce, this can only be a matter of estimate, based on the knowledge of the resources of the country, which may be drawn from by Georgetown Harbor, as well as the expansion of commercial plans proposed by the business men of this community.

It would scarcely be fair to say that anyone could foresee that the commerce would be less than that stated above; it is scarcely probable that it would remain stationary; therefore, the natural conclusion is that it would increase in proportion as ships could carry larger loads on deeper draft, thereby lessening the freight rates.

Georgetown Harbor possesses the peculiar advantage of not being forced to depend upon railroads for the supply of her port's commerce, because it is tributary to about 800 miles of navigable rivers, reaching to many parts of the State. These highways, free to all, will of necessity always furnish Georgetown Harbor with no inconsiderable amount of trade. This will be proportionate to the free and safe navigation provided on the rivers by the General Government.

As the value of the commerce apparently more than doubled between the years 1886 and 1902, a period of sixteen years, largely brought about, no doubt, by the improvements made in the harbor and rivers in the State by the Government, it is but fair to assume that, with continued improvement on the rivers and deeper water furnished in the harbor, with the continued prosperous wave over the country, it ought to increase under these conditions more rapidly in the future than it has in the past. It is said now that the value of the commerce to-day is at least $600,000 more than that reported above.

NATURAL FEATURES.

After leaving the mouth of Sampit River, which is a part of Georgetown Harbor, and proceeding down Winyah Bay seaward, there are two channels which fork, opposite Frazier Point, about at beacon No. 5—one running around the curved western shore of Winyah Bay and known as the western channel, while the other cuts across, forming a broken line of a chord, so to speak, of the arc of the curve of the western side. This other is known as the eastern channel.

Thirty years or more ago, so it is said, the western channel was in use and not the eastern, but some time after that the western side was abandoned and the eastern channel adopted, and which has been in use ever since. Why one was rejected for the other is not known, except that perhaps the western side showed a disposition to shoal.

All shipmasters and pilots claim now that it would be much preferable to improve the western side for navigation. They give as their opinion, and not without good reason, too, that ships could pass through the western channel during nights and thick weather when it would be impossible to make the trip on the eastern side. They say that the western channel being near the land, the shore line would be visible as a guide, and, further, that the thread of the current being parallel with the lines of this channel, they would be enabled to steer straight courses and thus avoid dangerous side drifts.

By comparison the eastern channel possesses none of these advantages, it being much farther removed from the shore line and contains cross currents.

At present the depth of water in the eastern channel is greater than that in the western. This has probably been caused by the use of the western being abandoned by the deeper draft vessels.

As far back as the year 1800, when there was probably very little, if any, navigation in either, a chart of that date shows the depth in both to be about the same.

The opinions of different persons interested in the navigation in Georgetown Harbor being so positive in favor of the improvement of the western channel, they were requested to put what they had to say on the subject in writing, which will be forwarded to you for information with this report.

In regard to this matter, the opinion of the undersigned is that the western channel would undoubtedly be easier of navigation in all kinds of weather than the eastern. The first cost of dredging the western one would be greater than the eastern, but it might be worth more to the shipping of the port. After once improved, it would probably not cost more for maintenance than the one on the eastern side. Though the distance is somewhat greater on the curved side than on the eastern side, still there would be only a few minutes difference to boats going by either route. As to cross currents in one and straight in the other, this can not be stated as a fact unless so proved by observations. It does seem, however, that the western channel lies more nearly in the direction of the natural flow than the eastern one.

Very respectfully, your obedient servant,

REID WHITFORD,
Assistant Engineer.

Capt. J. C. SANFORD,
Corps of Engineers, U. S. A.

LETTER OF PILOT COMMISSIONERS OF GEORGETOWN, S. C.

GEORGETOWN, S. C.

DEAR SIR: If any dredging is to be done in Winyah Bay, under the new river and harbor act, we the undersigned pilot commissioners of Georgetown, S. C., would like to recommend that it be done in what is known as the western channel, because it is straighter, easier for navigation, and plainer on account of the woods and banks being nearer, and the natural slope of the current is also with this channel, while in the eastern channel there are cross currents to be encountered.

Prior to 1865 the western channel was used exclusively. From the best information we can get now, the depth is 11 feet, and it has been gradually deepening since its increased usage on account of commerce coming through the Estherville Canal.

J. B. STEELE.
CHAS. S. CONGDON.
LOUIS S. EHRICH.
G. H. WATTS.
A. A. SPRINGS.
D. L. ELLIS.

Mr. REID WHITFORD,
United States Assistant Engineer.

LETTER OF PILOTS OF GEORGETOWN HARBOR, SOUTH CAROLINA.

July 25, 1902.

We, the undersigned pilots of Georgetown Harbor, hearing that the Government is about to make some improvements in the way of deepening the channel in Winyah Bay between Georgetown and the sea bar, would respectfully suggest that the improvement be made in the westward channel in place of in the eastward one, for several reasons: (1) Because the westward channel affords, by the woods along the shore, a guide for boats passing in thick weather; (2) that the bottom of this part of the bay being mud, can be more easily dredged, and as the natural flow of the water in the bay is on this side it may be kept deep much easier.

This channel can undoubtedly be used by ships in such weather as is impossible to use the eastward one. There are also cross currents in the eastward channel which are not in the westward one, and, altogether, we think that the westward channel would be better for shipping.

Very respectfully,

Capt. G. H. Watts, *Pilot.*
Capt. Thos. P. Fraser, *Pilot.*
D. R. Nesmith, *Pilot.*
A. A. Wilson, *Pilot.*
Antonia A. Smith, *Pilot.*

Mr. Reid Whitford,
United States Assistant Engineer.

LETTER OF ATLANTIC COAST LUMBER COMPANY.

Georgetown, S. C., *August 1, 1902.*

Dear Sir: In accordance with conversation the writer had with Captain Springs and your Mr. James in regard to which channel is preferable:

We have talked over same with both Captain Thorson, of the steamship *Georgetown* and Captain Blake, of the steamship *Aragon*, and they both hold the same opinion that we do, viz, that it would be much better to dredge out the southern channel—meaning the one that was used years ago—on account of its being freer from cross currents and not so liable to change as the one now being used.

We expected also to take this up with Captain Fickett, of the *Waccamaw*, but have not been able to see him up to the present writing, and as your clerk stated you wished the map, will not hold it any longer. We will ask Captain Fickett to call at your office and give you his idea in regard to this matter.

Yours, very truly,

Atlantic Coast Lumber Co.,
By Raymond S. Farr,
Assistant General Manager.

Mr. Reid Whitford,
United States Assistant Engineer.

LETTER OF CAPT. A. C. FICKETT.

Georgetown, S. C., *August 2, 1902.*

Dear Sir: In accordance with your request for an opinion regarding the practicability of the two channels in Winyah Bay, would advise using the western channel as being far better in every way; being more convenient for ships going up and down, as it follows the natural trend of the current, making it easier to keep up and giving a shore line to follow in the night or thick weather.

Very truly, yours,

A. C. Fickett,
Master Steamship Waccamaw.

Mr. Reid Whitford,
United States Assistant Engineer.

List of vessels at and entering the port of Georgetown, S. C., during the calendar year 1901.

Name.	Character.	Length.	Breadth.	Depth.	Gross tons.
		Feet.	*Feet.*	*Feet.*	
Waccamaw	Screw steamship	256	42	14	1,359
Georgetown	do	256	42	14	1,359
Saginaw	do	238	34.3	17.1	1,835
Richmond	do	206	33	21.6	1,437
Oneida	do	205.8	29.9	18.6	1,322
Geo. W. Clyde	do	256	35	19.2	1,848
Wm. P. Congdon	Screw steamer	75.2	18.2	7.8	68
S. S. Brewster	do	77.5	18.5	7.6	50
Martha Helen	do	82	16.7	7.4	75
Bon-Accord	do	67.3	14.4	5	42
Henry Lloyd	do	40.5	12.2	4.8	13
Fearless	do	58	11	4	18
Emma A. Twiggs	do	53	13.2	4.5	16
Pender	do	52.7	14.9	3.4	28
Bertie	do	49.5	9.8	3.5	16
E. T. Williams	do	81	21	9	97
Robert E. Lee	do	67	17	4.5	56
Two Brothers	Stern-wheel steamer	75.1	30.1	5.4	97
Louisa	do	101	25	5	280
Frank Sessoms	do	86.6	22.8	3.6	79
Merchant	Side-wheel steamer	147.7	29.6	5.4	405
Governor Safford	do	129.6	26	7.5	307
Ruth	do	81	26	4	89
F. G. Burroughs	do	125	22	6	283
John M. Cole	do	130	39.6	5	318
Wm. Elliott	do	101	31	6	171
Eutaw	do	156	29.8	7.8	547
Planter	do	155	32.8	9.1	499
Winyah	Schooner	43.2	16.4	6.1	18
Blanche Creamer	do	46.1	14.4	4	15
We Go	do	44	13.7	4.3	18
Hugh	do	47.6	14.2	3.4	14
Waccamaw	do	137.7	33.3	14.5	458
E. A. Danenhower	do	116.6	30.2	8.7	228
Nellie Floyd	do	136	33	15.4	457
Bayard Hopkins	do	118	30	9	269
Wm. Linthicum	do	112	27.6	8	156
Robert McClintock	do	96	26.7	7.4	154
Warren B. Potter	do	130	32.4	12	368
Chas. H. Sprague	do	122	30.7	9.5	318
Willie L. Maxwell	do	131.6	32.7	9.5	315
Puritan	do	85.5	28.7	7.3	116
Myra W. Spear	do	99.2	27.6	7.5	156
Geo. R. Congdon	do	133	32.4	14.8	458
Edward L. Martin	do	87.2	23.6	6.8	84
Rebecca R. Douglass	do	138.8	33.9	9.5	475
Percy & Lillie	do	141	33.5	14.1	503
Golden Ball	do	124.2	30.3	10.5	286
Chas. Linthicum	do	104	26.4	8.2	131
J. A. Beckman	do	140.7	34.2	16.1	485
Edward W. Young	do	149.5	34.4	12.3	424
Venus	do	108	29.4	9.1	204
Fannie Reiche	do	143.1	34	10.1	463
Sarah D. J. Rawson	do	140.5	34.8	11.1	387
John T. Russell	do	66.2	22.2	4.7	36
William Churchill	do	143.6	34.7	11	432
Abbie C. Stubbs	do	130	32.2	12	345
Etta	Sloop	47	11	3.3	8
Clipper	do	31	11	2.9	10
Leila	do	31	10	2.5	8
Liza Jane	do	40.8	12.5	4.9	17
Socastee	Barge	47	12	4	16
Enterprise	do	41.5	12	3.5	17
Willie	Yacht	40	9	4	[a]6
Madge	do	35	7	2	[a]3
Sprite	do	37	8	3	[a]5
Leilah	do	40	8	3	[a]5
Thistle	do	43.6	11.5	3.9	[a]13
Almont	do	40	8	5	4
Pelican	Naphtha launch	30	7	2.5	3
Wapella	do	30	7	2.5	3
Maria C	Yacht	35	10	4.5	8
Petrel	do	40	10	3.5	9
Advance	do	25	5.5	1.5	[a]2
Loretta	do	40	9	3	[a]7
Husted	do	42	8	3	[a]5
Syra	do	36	7	3	[a]3

[a] Approximate.

SURVEY OF GEORGETOWN HARBOR, SOUTH CAROLINA, INCLUDING SAMPIT RIVER, AND THENCE TO AND INCLUDING THE OCEAN ENTRANCE TO WINYAH BAY.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., September 26, 1903.

GENERAL: I have the honor to submit herewith report, in duplicate, with map, of a survey of Winyah Bay, made by Assistant Engineer Reid Whitford for the purpose of ascertaining the cost of an 18-foot channel at mean low water from the ocean entrance to a point 1 mile above the city of Georgetown, S. C., on the Sampit River.

Dredging at the entrance between the jetties to increase the depth from 15 feet to 18 feet will cost about $96,500. Dredging in Sampit River will cost about $113,500. Between these two places lies Winyah Bay. The present channel in the bay where dredging will be required is called the eastern channel. Its length is 22,830 feet, and its shoalest place is 13 feet. To dredge contemplated channel will cost about $166,000. The western channel, which was used at some previous time, is 25,700 feet long, and its shoalest place is 9½ feet. To dredge it will cost $310,000, an increase of $144,000 over the eastern channel.

The western channel is favored by masters of vessels and pilots because it follows the land, has no cross currents, and could be easily navigated in fogs. The eastern channel is far from land and has cross currents, caused by the water's flowing into Mud Bay. In foggy weather, when the range lights could not be seen, there would be no shore line to act as guide, and the cross currents might throw the vessel out of the channel. Although the current observations show that at ebb tide the bulk of the current flows around Frazier Point into the eastern channel it would seem from the map that it should follow the western channel, and is attracted toward the eastern channel on account of the deeper water there. Undoubtedly the best and safest channel for navigation purposes can be obtained by dredging the western.

But the matter of cost has to be considered. It has been shown that the item of dredging is $144,000 more. The training wall will probably be required to throw the current in its direction in order to maintain the channel. Mr. Whitford proposes to build it with mattress foundation and stone on top, and estimates its cost at $148,808. Its construction is costly, as it will have to cross the deep water (21 feet) leading to the eastern channel; and although the mattress might be omitted the cost will still be about $130,000. It is not believed that the training wall from Frazier Point to Marsh Islands will be required. No work has been done on the eastern channel, but it has maintained itself well. After it is dredged to 18 feet the increased flow of water will maintain the depth.

It remains to be considered whether the interests of navigation justify the expenditure of $274,000 in order that vessels may use the western channel in time of fog, when the ranges can not be followed. As fogs are not frequent on this coast the resulting delay in using the eastern channel will not be serious. I am of the opinion that the eastern channel should be selected, even though it be decided to build the training wall across Mud Bay to prevent deflecting currents. Its cost would be $40,000, omitting the mattress foundation, and the saving would still be $234,000.

In the construction of the jetties at the entrance to the bay, in order to get immediate effect upon the channel, the jetties were carried out to the full length and height with only a narrow crest. The top has been knocked down by the waves to the level of low water and below for a long distance, and it becomes necessary to raise the jetties to the contemplated height of 6 feet above mean low water to get the full benefit of the scour. This is especially necessary, since it is desired to increase the present depth by 3 feet. The mean rise and fall of tide is 3½ feet. To build the jetties throughout their full length to their proper dimensions will cost about $325,000.

Out of the original estimate of $2,500,000 for completing the jetties, to provide 15 feet at mean low water, there remains on September 1, 1903, an approximate balance of $406,000. The cost of providing the 18-foot channel, 400 feet wide, as recommended by me, is as follows:

Dredging:	
Entrance to Winyah Bay	$96,500
Eastern channel	166,000
Sampit River	113,500
Total	376,000
Rebuilding jetties	325,000
	701,000
Less balance from the present 15-foot project	406,000
Total	295,000

I believe that the improvement of the channel leading to Georgetown, S. C., to the extent indicated, is justified by the commercial interests involved.

The rivers that empty into Winyah Bay are under improvement by the General Government. Congress has recently authorized an expenditure of about $120,000 on the Great Pedee River to allow the products from its upper portion to be brought to tide water. The Waccamaw River is now being surveyed with a view to revising its project for improvement. The canal connecting the Santee River and Winyah Bay is being deepened. The completion of these improvements will naturally add to the commercial importance of Georgetown and cause its business to increase.

The commercial statistics show an increase of 1902 over 1901 of 139,482 tons, a gain of over 50 per cent; of 1902 over 1900, 257,832 tons, a gain of almost 200 per cent. The figures for the past three years are as follows:

Year.	Tons.	Value.
1900	129,639	$6,749,433
1901	247,989	8,457,906
1902	387,471	9,310,682

The great increase is in lumber. The figures are as follows:

Year.	Tons.	Value.
1900	63,400	$409,638
1901	171,094	1,090,507
1902	317,339	2,145,241

This is owing to the establishment at Georgetown of the Atlantic Coast Lumber Company, said to be the most extensive plant of the kind in the world. The company operates several large steamships. The report of Assistant Engineer Reid Whitford is inclosed. He has considered fully what may be required to secure and maintain the channel, and has given the cost of every item.

Very respectfully,

G. P. HOWELL,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, SOUTHEAST DIVISION,
Savannah, Ga., October 2, 1903.

Respectfully submitted to the Chief of Engineers.

The western channel seems to be preferred by all those interested in the improvement. With a proper arrangement of training walls it is capable of being rendered far more stable than the eastern channel, with its uncertain cross currents and exposed locations.

It is even possible, with properly arranged training dikes, so as to direct the ebb and flood currents, that the western channel might be deepened by natural scour to the required depth. A dike, for example, constructed on the line between the second "R" in "Frazier" and the "W" in "western," beginning where this line intersects the "proposed stone training wall" and ending at the 12-foot contour of depth near "W," would direct a large volume of water into the western channel during ebb tide, and another on the line between the letters "A" in "eastern channel" and "western channel" (in the word "channel"), respectively, extending from near the 4.9-foot sounding near the eastern channel to the 6-foot sounding near the western channel, would concentrate a large volume of the flood current into the western channel. The combined lengths of these two dikes would be less than that of the "proposed stone training wall" and need not cost as much, and certainly not much more than the "proposed stone training wall for eastern channel." If built in advance of any dredging, their influence might be sufficient to obviate the necessity for any dredging in the western channel.

The difference in the cost between the two channels, as estimated, becomes a matter of minor consideration when the wish of those interested in the improvement is to be regarded and the unquestioned advantages of navigation and permanency of channel are involved.

I do not approve of the selection of the eastern channel for improvement or of the location for the stone training walls as proposed, but recommend that the western channel be improved, and that training dikes be located as explained above.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

United States Engineer Office,
Georgetown, S. C., August 11, 1903.

Captain: In compliance with instructions contained in your letter of July 21, 1903, I have the honor to send by this mail tracing of the survey from the ocean entrance of Winyah Bay to a point about a mile above the city of Georgetown, made for the purpose of ascertaining the estimated cost of deepening the channels to 18 feet depth and 400 feet width at mean low water between these points.

It is thought that considerable more dredging than 400 feet in width will have to be done to actually provide and maintain a 400-foot channel at the jetties, and 25 per cent has been added to the cubic yards found to be contained in the south-jetty and middle-ground channels. The cubical contents were determined by getting an average cutting from the soundings inclosed between lines, 400 feet apart, on map of June 30, 1903, for 18 feet depth at mean low water, being the latest survey of these channels.

Total length of both channels to be dredged (south jetty and middle ground) 14,800 feet.

Estimate.

	Cubic yards.	
South-jetty channel	234, 074	
Middle-ground channel	349, 536	
Material, sand, mud, and shells	583, 610, at 15 cents	$87, 541. 50
Add 10 per cent for contingencies		8, 754. 15
Total		96, 295. 65

It may be in order that to hold this depth the superstructure of stonework on both the north and south jetties will have to be built up to their originally intended height, which is about 6 feet above mean low water.

The following estimate of stonework is therefore suggested as an item to be included in the general amount for future possible work at the ocean entrance:

Estimate.

	Tons stone.	
North jetty	42, 250	
South jetty	76, 200	
Stone work, in place	118, 450, at $2.50	$296, 125. 00
Add 10 per cent for contingencies		29, 612. 50
Total		325, 737. 50

This estimate was determined as follows, and can only be considered as approximate, as figures of more accuracy can only be furnished after more careful cross section of stone work of existing jetties, time not being allowed for this detailed investigation. One hundred pounds per cubic foot was taken as weight of stone. The outer end of jetties cross sectioned every 500 feet, and an assumed cross section plotted on existing stone work, 40 feet base, 20 feet width of crest, and 6 feet in height above mean low water. The areas of these cross sections were all determined by a planimeter, and an average one secured for multiplication by the length of the jetty in question.

The inner shore ends of the jetties, where the water is wasting through and over them considerably on the ebb tide, were estimated to require 150 tons stone for each 100 linear feet, or 1½ tons to the foot, to build them up to height of 6 feet above mean low water.

It is not certain that the foregoing expenditure for stone work is necessary to secure and maintain the 18-foot depth at mean low water, though it may be. Therefore this provision is made in the general estimate.

One-half of the above estimate for stone work might properly be charged to maintenance of old stone work.

After leaving the entrance, coming up, near Mosquito Creek, the channel forks, one being known as the eastern channel and the other as the western channel. They become one channel again farther up, all of which is shown on accompanying tracing.

The eastern channel is now in use and has been for a number years, but the western channel was the one originally navigated. Just exactly what year and for what reason the western channel was abandoned for the eastern is not known by the undersigned.

All seafaring men and others interested in the actual running of boats on Winyah Bay say the western route is greatly preferable to the eastern, and that though the eastern route may be improved, still there will be cross currents in it which will prohibit the running of their ships in dark and foggy weather there, but that the western side, where the land can be tracked around, so to speak, and the currents kept head-to to the ships, will give very little trouble from these causes.

The written opinions on this subject of a number of masters of vessels and pilots were forwarded to your office with preliminary examination report of Georgetown Harbor, dated August 18, 1902, and all express themselves in favor of the western channel being improved.

In the opinion of the undersigned, though the improvement of the western channel will cost more, it will be much more beneficial for the future development of the port, not only for reasons given, but also because the Estherville-Minim Creek Canal, connecting Santee River with Winyah Bay, has one of its terminals in the western channel, and all boats to and from the Wateree, Congaree, and Santee rivers will of necessity have to use this channel, and sooner or later no doubt it will be essential to deepen it regardless of the eastern route.

Estimate for the western channel.

[400 feet width, 18 feet depth at mean low water, length 25,700 feet.]

Cubic yards, sand and mud, 1,875,822, at 15 cents	$281,373.30
Add 10 per cent for contingencies	28,137.33
	309,510.63

Estimate for the eastern channel.

[400 feet width, 18 feet depth at mean low water, length 22,830 feet.]

Cubic yards, sand and mud, 1,008,428, at 15 cents	$151,264.20
Add 10 per cent for contingencies	15,126.42
	166,390.62

It will be observed that this makes the dredging in western channel cost $143,120.01 more than in the eastern, but if the eastern channel can not be used after its improvement except in fair weather it is thought that the western should be given preference, even though the first cost seems to be more.

Some current observations were made at Frazier Point to determine the general directions of the ebb flow, the result of these being shown on accompanying tracing.

Time was not allowed to make these observations as thorough as they might be, but sufficient information was gained to indicate that the greater bulk of the ebb current forks at Frazier Point and follows the deeper water in the eastern channel, evidently being attracted in that direction by the less obstructed passageway of this course, as well as being drawn toward the large area of Mud Bay.

It is believed that once the western channel is deepened the current will naturally go in that direction, but as an aid to nature to deflect the water to the western it may be necessary to provide for a training wall of stone and mattress foundation to spring from Frazier Point and run in the direction as shown on tracing.

It would be proposed to build it of mattress foundation, of fascines and grillage poles, laid on the bottom, 30 feet wide, to receive stone filling to weigh from 10 to 300 pounds, with its crest about 5 feet wide and about 2 feet above mean low water. This would contain an area of stone in cross section averaging about 204 square feet, length of training wall to be about 5,700 linear feet.

Therefore the following estimate of its approximate cost is made, 100 pounds again being taken as the weight of 1 cubic foot of such stone:

Mattress foundation, 19,000 square yards, at $1	$19,000
Stone filling, 58,140 tons, at $2	116,280
	135,280
Add 10 per cent for contingencies	13,528
	148,808

It is by no means certain that this training wall will be required to turn the current in the western channel, though it may be; therefore, provision is made in the general estimate.

If the eastern channel should be adopted, there would probably be required a training wall reaching across the mouth of Mud Bay from Frasier Point to Marsh Islands, for the purpose of maintaining the depth dredged and in deflecting the current straight down this channel, and to be constructed in general as the training wall for the western channel.

This would contain an area of stone in cross section averaging about 74.75 square feet, length of training wall to be 8,500 feet, the following estimate of approximate cost being made:

Mattress foundation, 28,333 square yards, at $1	$28,333
Stone filling, 31,768.5 tons, at $2	63,537
	91,870
Add 10 per cent for contingencies	9,187
	101,057

Estimate.

[For shoal at and above mouth of Sampit River, at Georgetown, width to be 400 feet, depth 18 feet at mean low water, length 11,200 feet.]

460,284 cubic yards sand and mud, at 15 cents	$69,042.60
85,671 cubic yards hardpan, at 40 cents	34,268.40
	103.311.00
Add 10 per cent for contingencies	10,331.10
	113,642.10

RECAPITULATION.

General estimate:	
North and south jetty channels, dredging	$96,295.65
Stone work, rebuilding north and south jetties	325,737.50
Western channel, dredging	309,510.63
Western channel, stone training wall	148,808.00
Dredging shoal at Georgetown	113,642.10
Grand total	993,993.88

Of the above, for works of improvement, $831,125.13; maintenance, $162,868.75.

Were the eastern route substituted for the western the total amount of this estimate would be $803,122.87, the difference being caused by less cost of training wall and dredging, for each item, as above shown.

The original estimate of the Board of Engineers, January 17, 1889, for completing the north and south jetties in a manner to provide 15 feet depth at mean low water was $2,500,000.

Approximate amount which has been expended in obtaining this depth under present existing project, so far as known to this office, about $2,000,000.

Approximate balance of original estimate left unexpended, $500,000.

Approximate aggregate estimate required to provide a channel 18 feet depth at mean low water, about 400 feet wide, from ocean entrance of Winyah Bay to a point about 1 mile above city of Georgetown, through the shoals in the jetty channels and the upper bay, $993,993.88.

Amount required for covering distance as stated, in excess of amount originally estimated for providing only 15 feet at mean low water, which was confined strictly to the jetty channels, $493,993.88.

The estimates for dredging eastern, western, and Georgetown shoals were made by plotting these shoals on a scale of 200 feet to the inch for the eastern and western channels and 100 feet to the inch for shoal at Georgetown, the cubical contents being determined in a similar manner to that used for south-jetty and middle-ground channels.

The current directions were obtained by perforating and telescoping two galvanized-iron buckets, the bottom of one being down and the bottom of the other up, a wooden rod being passed through the center of each, with a block of wood secured to top one and a small flag above that, enough broken stone in the bottom bucket to submerge all to the top of the block, only leaving the small flag out of the water.

Observations were taken on this float at intervals of five minutes by simultaneous angles from two transits.

The survey represented by accompanying tracing was made from a true meridian, the shore line being run along west side of the bay, offsets being made at intervals across the water.

The soundings were located by two transits where any dredging was to be done, and by one transit, with the sounding boat on a back range, where no work of improvement is contemplated. Angles locating sounding boat were taken every thirty seconds. All points on opposite side of bay were located by triangulation and calculated distances.

The soundings were reduced to the mean low-water plane at three different points: First, at North Island; second, at Estherville-Minim Creek Canal mouth in Winyah Bay; and third, at Georgetown. These mean low waters had previously been secured by recording all the low waters for a long time, including a number of lunar months, in getting their average.

The tonnage and value of commerce on Winyah Bay, as reported by Mr. W. D. Morgan, mayor of Georgetown, and forwarded with annual report for fiscal year ending June 30, 1903, are as follows: 387,471 tons, valued at $9,310,682.

A further statement of the commerce of the port, and reasons why the improvement should be carried to 18-foot depth at mean low water, were made in full by Mayor Morgan, together with a committee of gentlemen from the Georgetown board of trade, to the Board of Engineers, which met at this office June 18, 1903.

Very respectfully, your obedient servant,

Reid Whitford,
Assistant Engineer.

Capt. G. P. Howell,
Corps of Engineers, U. S. A.

N 17.

PRELIMINARY EXAMINATION OF PORT ROYAL BAR, SOUTH CAROLINA.

[Printed in House Doc. No. 221, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith, for transmission to Congress, report dated April 7, 1903, by Capt. J. C. Sanford, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved June 13, 1902, of Port Royal bar, South Carolina, "with a view to providing a channel 25 feet deep and 500 feet wide."

The locality in question is the entrance to Port Royal Sound and Beaufort River, South Carolina, on the latter of which are situated the United States naval station and the city of Beaufort. This has always been the best natural entrance along the South Atlantic coast, and although now as good as it has ever been the present examination has for its object the securing of increased channel dimensions.

Captain Sanford states that he does not regard this locality as worthy of improvement by the General Government at the present time, and the conclusions of the district officer are concurred in by the Division Engineer, Lieut. Col. James B. Quinn, Corps of Engineers.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of said act, and attention is respectfully invited to the Board's report of June 19, 1903, in third indorsement thereon.

The Board has made the subject a matter of careful investigation, including the holding of a public hearing, and in closing its report expresses the opinion that it is not desirable that the United States should at present undertake the improvement of Port Royal bar.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. J. C. SANFORD, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., April 7, 1903.

GENERAL: I have the honor to submit the following report on an examination of Port Royal bar, South Carolina, with a view to providing a channel 25 feet deep and 500 feet wide, made in accordance with the requirements of the river and harbor act approved June 13, 1902:

This bar was surveyed by United States Coast and Geodetic Survey, first, in 1855, and then in 1859, 1863–64, 1896 and 1900, with possibly examinations in some of the intervals. Charts have been furnished me showing the five surveys above indicated.

The first of these made in 1855 was called a reconnaissance. Three channels were shown, known respectively as "the eastern channel," "the southeastern channel," and "the south channel." Besides these three there were other channels of minor importance. Of these three channels the southeastern and the south channels were about equally good, and showed 3¼ fathoms, or 19.5 feet, as the minimum depth at mean low water. Between these two channels there is a shoal called Martins Industry. The eastern channel was inferior to both, and has always held only a secondary position.

In 1859 this bar was again sounded, and the officer in charge, Lieut. Commander C. W. Fauntleroy, U. S. Navy, reported that little or no change had occurred since the date of the hydrographic reconnaissance made in these waters by Lieutenant-Commander Maffitt (1855).

In 1863–64 another survey was made and this showed the south channel to be somewhat better than the others. There was a minimum depth of 19.5 feet in the south and 18 feet in the eastern channel.

In 1896 the south channel was narrower and shoaler than the southeastern channel, and had deteriorated markedly from the survey of

1863–64. While the southeastern channel was the best, it was much impaired by a number of lumps of less than 18 feet at mean low water. This may have been due to more thorough sounding than in previous years. There was still shown, however, a possible channel of 19.5 feet at mean low water.

In 1900 the eastern channel, which was then vastly superior to the southern, showed a central depth of not less than 21 feet at mean low water, with comparatively few lumps. This condition of the entrance channel in 1900 was better than at any time previously.

A comparison of the lines of deepest water, as indicated on the charts by the sailing lines, has been made, using the charts of the Coast and Geodetic Survey from 1859 to 1900 (the reconnaissance of 1855 could not be used, as there were no accurately located points). This study, as shown on chart[a] herewith, indicates a movement of the southeastern channel of about three-fourths of a mile to the southward. The shoal separating the southeastern from the south channel has moved westward, and has made the south channel very narrow and much shoaler. In 1896 there seems to have been a retrogade movement in the southeastern channel, but as this was only in the sailing line the general law of movement was not violated. It seems probable that this southerly movement will continue until the southeastern channel becomes the southern channel and another channel breaks out to the northward. As it has taken over forty years for the southeastern channel to move three-fourths of a mile, it will probably, with a gradual southwesterly movement, remain the main channel for a century yet to come. It does not seem at all probable that the south channel will again deepen under the action of natural forces, for it has already proceeded too far to the westward and beyond the line of direction of the escaping currents. For any improvement that might be designed, the location of the southeastern channel should be adopted.

Dredging would seem to be the only feasible plan for securing a channel 500 feet wide and 25 feet deep at mean low water. The locality being very exposed, a suction dredge of the seagoing type would be required in order to produce such a channel within a reasonable time and at reasonable cost. The improvement would not be permanent, inasmuch as the channel is constantly changing under the continued action of waves and currents, and dredging would have to be done at short intervals, if not continuously. A reasonable permanency of the channel might be secured by detached jetties on the shoals, but on account of the great cost of these it would, in my opinion, be more economical to maintain the channel by dredging. As the crest of the bar is fully 9 miles from the shore line, the cost of jetties extending from the shore to the crest would be prohibitory, even if the commerce of the port were many times as large as at present.

I have had commercial statistics of Port Royal bar for the year 1901 prepared by Mr. W. D. Niles, an employee of this office, and append his report. These show that the business in that year was small. It is likely to be still smaller, owing to the removal of the Port Royal naval station to Charleston, and to the decline in the phosphate business at and near Beaufort, the largest phosphate mining company in the vicinity having gone out of business within the past year. No forecast can be made of the increase of business that might result from the improvement of the entrance channel; but as Port Royal entrance is but 15 miles from Savannah River entrance and 61 miles from Charleston Harbor entrance, I see no reason to expect any notable increase.

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[a] Not printed.

The port of Port Royal has fallen off in importance within the past five years, and its business is now inconsiderable, as shown by the statistics. Port Royal entrance has always been the best natural entrance along the South Atlantic coast. It is now in as good condition as it has ever been known to be in. Vessels drawing 27 feet of water can enter at high tide, and more depth can be brought in over the bar than can be carried up to the railroad terminus at Port Royal.

I do not regard Port Royal bar as worthy of improvement by the Government at the present time. No survey is considered necessary.

Very respectfully, your obedient servant,

J. C. Sanford,
Captain of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Engineer Office, U. S. Army,
Norfolk, Va., April 13, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

Until more satisfactory statistics of the commercial interests to be benefited by further work of improvement upon the bar are available the conclusions of the district engineer are concurred in.

James B. Quinn,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
April 17, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

Additional information has been called for, if available.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Third indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., June 19, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given careful consideration to the within report of the district officer upon a preliminary examination of Port Royal bar, South Carolina, "with a view to providing a channel 25 feet deep and 500 feet wide," the indorsement of the division engineer thereon, and other data available. On June 16, 1903, a committee of the Board held a public hearing at Beaufort, S. C., at which interested parties appeared to advocate the improvement.

Prior to 1901 depths upon Port Royal bar exceeded those at any other Atlantic coast sea entrance south of Norfolk, Va. Inside the entrance are anchorage areas of great capacity and many localities suited for wharves and terminals. To-day vessels drawing 27 feet may enter at high tide, and more depth can be carried over the bar than to the railroad terminus at Port Royal.

Notwithstanding the natural advantages afforded by this deep natural entrance, there is noted a decline of commerce during the past seven years. The collector of customs at Beaufort reports that the value of exports dwindled from $4,939,417 per annum in 1894 to $166,189 in 1901. During this period the value of imports varied irregularly between $59,054 and $428,896.26. This decrease has been due to the decline of the phosphate industry, and there is no indication of a revival of phosphate shipments. There is little or no coastwise trade crossing Port Royal bar. The single railroad making Port Royal its terminus is unimportant, and is probably controlled by the Atlantic Coast Line, whose main interests are at other ports.

The naval station and dry dock at Port Royal are of relatively small importance since Congress has provided for a navy-yard at Charleston Harbor, but 61 miles distant. It is not understood that provision has been made for the reconstruction of the Port Royal dry dock or that any such provision will be made.

To meet the demands of commerce no improvement of Port Royal bar is necessary. As bearing upon naval requirements, attention is invited to the recent transfer of expenditures for docks, machine shops, etc., from Port Royal to Charleston.

At the public hearing in the locality, much stress was laid upon the value of Port Royal as a harbor of refuge. The depths are already ample for such a purpose, in so far as concerns merchant vessels now passing the vicinity. To enable a battle ship to enter at any stage of tide and under all conditions of weather would require a deepening of the channel across the bar by about 9 feet. The great distance of the crest of the bar from the shore line indicates that any such deepening could be brought about and maintained only by more or less continuous dredging. In considering the desirability of creating a harbor of refuge at Port Royal primarily for deep-draft war ships, it is again necessary to refer to the neighboring harbor of Charleston, which now has a greater depth of entrance than Port Royal, and which will probably be further improved.

For the reasons given the Board is of the opinion that it is not desirable that the United States should at present undertake the improvement of Port Royal bar, South Carolina.

For the Board:

Chas. J. Allen,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

REPORT OF MR. W. D. NILES.

MOULTRIEVILLE, S. C., *August 20, 1902.*

CAPTAIN: Complying with your directions, I submit the following tabulated statement of commercial statistics for the year 1901 of Port Royal bar, South Carolina. The data for this statement were obtained by correspondence and personal information:

Articles.	Tons.	Value.
Fertilizer materials	29,333	$201,000
Phosphate rock	90,873	234,203
Salt, coal, cement, and lumber	16,876	83,000
Coal	11,465	41,000
Total	148,547	559,203

Statement showing number of vessels that have entered Port Royal Harbor, South Carolina, during calendar year 1901.

[This statement includes vessels of from 100 to 4,000 tons.]

	Number of vessels.	Number of trips.	Tonnage.	Value.
United States Navy	18	61	22,589	....
Revenue Service	2	20	500	....
Light-House Service	2	10	500	....
Fish Commission	1	1	441	....
Merchant vessels	112	183	116,450	$9,810,000
Total	135	275	140,480	....

W. D. NILES.

Capt. J. C. SANFORD,
Corps of Engineers, U. S. Army.

N 18.

PRELIMINARY EXAMINATION AND SURVEY OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA.

[Printed in House Doc. No. 514, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, February 3, 1904.

SIR: I have the honor to submit herewith for transmission to Congress reports of April 8, 1903, by Capt. J. C. Sanford, Corps of Engineers, and of December 8, 1903, by Capt. G. P. Howell, Corps of Engineers, on preliminary examination and survey, respectively, of Waccamaw River, North Carolina and South Carolina, authorized by the river and harbor act approved June 13, 1902.

Waccamaw River is at present being improved under a project which provides for a channel 12 feet deep at all stages, with 80 feet bottom width, from the mouth of the river to Conway, S. C., and thence to

Lake Waccamaw a channel cleared of snags and other obstructions. In the opinion of Captain Sanford the river is worthy of improvement to the extent contemplated by the present project, and that a new project should not be entered upon until the present one is completed.

The commerce of the Waccamaw is reported to be about 120,000 tons annually, valued at about $1,600,000.

In his survey report of December 8, 1903, Captain Howell presents plans and estimates for work as follows: For dredging a channel 100 feet wide from the mouth to Conway, with depth at mean low water of 6 feet, $40,000; with depth of 9 feet, $70,000; and with depth of 12 feet (the present project depth), $120,000. Captain Howell recommends that the project for a 12-foot channel be maintained and that this estimate of $120,000 be adopted. The annual cost of snagging on the river above Conway is estimated at $5,000.

An alternative recommendation is submitted by the local officer in favor of a modified plan, which provides for a 12-foot channel to a point near Bucksville, and 6 feet thence to Conway, at an estimated cost of $50,000. For the reasons given in his indorsement of December 11, 1903, the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers, recommends for adoption this last-named plan and estimate.

These papers have been referred for consideration and recommendation by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and attention is respectfully invited to the Board's report of January 18, 1904, in seventh indorsement thereon. I concur in the conclusions of the Board, as follows:

> Having duly weighed the cost against commercial benefits, the Board is of opinion that it is advisable to continue the improvement of Waccamaw River, South Carolina, with a view to a channel 100 feet wide and 12 feet deep from its mouth to Bucksville, a distance of 36 miles, and a channel of the same width and 6 feet deep from Bucksville to Conway, a distance of 14 miles. The Board is further of opinion that it is advisable to continue snagging operations above Conway, but to a less extent than is indicated by the estimate of the district officer. The following is an estimate of cost of the work deemed advisable by the Board:

12-foot channel, 100 feet wide, from mouth to Bucksville	$15,000
6-foot channel, 100 feet wide, from Bucksville to Conway	35,000
Total	50,000
Annual cost of maintenance, including snagging above Conway	5,000

Very respectfully, your obedient servant,

A. MACKENZIE,
Brig. Gen., Chief of Engineers, U. S. Army.

HON. WM. H. TAFT,
Secretary of War.

PRELIMINARY EXAMINATION OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA.

UNITED STATES ENGINEER OFFICE,
Charleston, S. C., April 8, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of Waccamaw River, South Carolina, made in accordance with the requirements of the river and harbor act approved June 13, 1902:

The Waccamaw River rises in Waccamaw Lake, North Carolina, flows in a general southwesterly direction through North and South Carolina and empties into Winyah Bay, South Carolina. Its length is about 147 miles, and for the greater portion of its length it flows in a direction nearly parallel to the coast line, and not far from it.

A preliminary examination of this river was made in 1879, under Capt. Charles B. Phillips, Corps of Engineers. (Printed in Annual Report of Chief of Engineers for 1880, pp. 848–851.) Captain Phillips considered the river worthy of improvement and recommended securing a 12-foot channel to Conway, about 50 miles above the mouth, and removing overhanging and fallen trees, snags, etc., and making cut-offs at certain abrupt bends between Conway and Lake Waccamaw at an estimated cost of $29,237. The first appropriation made by Congress for improvement of this river was in 1880, when $15,000 was appropriated. In 1881 $10,000 was appropriated, and in 1882 $4,400. In 1883 a preliminary examination of the portion of the river from Conway (then called Conwayborough) to Lake Waccamaw was made by Capt. James Mercur, Corps of Engineers. (Printed in Annual Report, Chief of Engineers for 1884, pp. 1056–1058.) The following are the conclusions reached by him as to this portion of the river:

> The present commerce is exceedingly small; the prospective commerce, under the most favorable circumstances, not large.
>
> The cost of any permanent improvement would be immense. In my judgment the stream is not worthy of improvement, and the work not a public necessity.

In 1885 the estimated cost of Captain Phillips's above-stated project was revised and placed at $138,400. (See Annual Report, Chief of Engineers for 1885, p. 1105, and for 1886, p. 1022.) There has thus far been appropriated and allotted under this project $111,900, of which $9,000 was allotted from the appropriation of June 13, 1902, and, with the exception of a small amount expended on putting plant into good repair, is still on hand.

In the Annual Report, Chief of Engineers for 1902, page 238, it was stated that to June 30, 1902, about $26,646.69 of the total amount expended on the river had been for maintenance. Deducting this amount from the total appropriated and allotted, and then deducting the remainder from the estimated cost of the project, $138,400, it would appear that to complete the present project would require further appropriation of about $53,146.69. There being considerable doubt, however, as to the present condition of the shoals whose improvement is contemplated in the present project, the approved project for the expenditure of the funds now on hand provides, among other things, for making a survey of the shoals below Conway on which the depth and width are less than required by the project, the purpose of the survey being to determine the amount now needed to complete the project.

I append report of Assistant Engineer Reid Whitford on the preliminary examination made in 1902 of the Waccamaw River from its mouth to Lake Waccamaw. I have personally examined that portion of the river from Conway to the mouth, and believe that the improvement as provided for in the present project is fully justified by the commercial value of the stream. I do not, however, believe that a new project for this river should be entered upon until the present one is practically completed, at which time changed conditions and increased commerce may justify further improvement. The river is, in my opinion, worthy of improvement to the extent contemplated by the present project. No survey beyond the above-mentioned survey of shoals below Conway, for which present funds are available, is required.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 16, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

The recommendations of the district officer are concurred in.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 25, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

Additional information has been called for, if available.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 9, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of "Waccamaw River, South Carolina," the indorsement of the division engineer thereon, and all other data available. On June 18, 1903, a committee of the Board held a public hearing at Georgetown, S. C., at which interested persons were given opportunity to express their views.

The Waccamaw River is about 147 miles long from its source in Waccamaw Lake, North Carolina, to its mouth in Winyah Bay, South Carolina. There is in existence a project providing for a 12-foot channel from Winyah Bay to Conway, S. C., a distance of about 50 miles, and for clearing the river of snags from Conway to the lake.

The upper third of the section below Conway is obstructed by numerous shoals and has a controlling depth of but 3 feet. Above Conway navigation is restricted to periods of high water.

The commerce of the Waccamaw is reported to be annually about

120,000 tons, valued at about $1,600,000. Of the foregoing about 41,000 tons, valued at about $140,000, may be credited to the river above Conway.

The district officer states that the approved project for the expenditure of funds now available for the improvement of this river provides for a survey of the shoals below Conway.

The Board is of the opinion that the Waccamaw River is worthy of improvement, provided the same can be effected at a reasonable cost, and recommends that the district officer be directed to complete the survey alluded to in the preceding paragraph, and to prepare estimates for channels from Conway to the mouth, 6, 9, and 12 feet deep, respectively, and of suitable width, in order that consideration may be given to such plans of improvement, having due regard to cost and probable resulting benefits. With regard to the snagging operations above Conway the Board recommends that the district officer be directed to prepare an estimate of the probable annual cost of the same.

For the Board.

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
July 16, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Waccamaw River, South Carolina, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors in the preceding indorsement, I recommend that the local officer be directed to make the survey and prepare the estimates of cost recommended by the Board.

A. MACKENZIE,
Acting Chief of Engineers.

[Fifth indorsement.]

WAR DEPARTMENT,
July 18, 1903.

Approved as recommended by the Acting Chief of Engineers.

E. ROOT,
Secretary of War.

[Sixth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, January 9, 1904.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with report on survey as recommended.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Seventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 18, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

In third indorsement hereon the Board of Engineers for Rivers and Harbors expressed the opinion that the Waccamaw River is worthy of improvement, provided the same can be effected at a reasonable cost, and recommended a survey, with estimate of cost, for channels from Conway to the mouth, 6, 9, and 12 feet deep, respectively, and an estimate of cost of snagging above Conway.

The accompanying report of the district officer, dated December 8, 1903, contains the information requested by the Board. This report, the indorsement of the division engineer thereon, and the related report of the assistant engineer in local charge of the Waccamaw River, have been examined and reviewed by the Board.

The estimated cost of the several channels to Conway is as follows:

Channel 6 feet deep, 100 feet wide	$40,000
Channel 9 feet deep, 100 feet wide	70,000
Channel 12 feet deep, 100 feet wide	120,000

An estimate is also given for a channel 12 feet deep to Bucksville, 36 miles above the river's mouth, and 6 feet deep from Bucksville to Conway, a distance of 14 miles, the cost being placed at $50,000. The estimated cost of snagging the river above Conway is $5,000 per annum. The annual expense of maintenance of the work recommended below would probably not exceed $2,500.

Having duly weighed the cost against commercial benefits, the Board is of opinion that it is advisable to continue the improvement of Waccamaw River, South Carolina, with a view to a channel 100 feet wide and 12 feet deep from its mouth to Bucksville, a distance of 36 miles, and a channel of the same width and 6 feet deep from Bucksville to Conway, a distance of 14 miles. The Board is further of opinion that it is advisable to continue snagging operations above Conway, but to a less extent than is indicated by the estimate of the district officer. The following is an estimate of cost of the work deemed advisable by the Board:

12-foot channel, 100 feet wide, from mouth to Bucksville	$15,000
6-foot channel, 100 feet wide, from Bucksville to Conway	35,000
Total	50,000
Annual cost of maintenance, including snagging above Conway	5,000

For the Board.

A. M. MILLER,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., August 15, 1902.

CAPTAIN: In compliance with instructions contained in your letter of July 31, 1902, I have the honor to make the following report upon the preliminary examination of Waccamaw River, North Carolina and South Carolina.

The examination was made with the view of investigating the commercial importance of the river in these two States, present and prospective, in order that a decision might be formed, based on these data, as to whether the river was worthy of a detailed survey, and looking to the formation of a new estimate for its future and more thorough improvement.

GENERAL FEATURES.

The river "has its source in Waccamaw Lake, North Carolina, and, after flowing in a southwesterly direction approximately parallel to and not far from the seacoast, empties its water into Winyaw Bay, at Georgetown, S. C. The lake is a body of fresh water about 3 miles wide and 5 miles long, with probable average depth of 8 feet, situated on the line of the Wilmington, Columbia and Augusta Railroad, about 25 miles from Wilmington, N. C. The total length of the river is possibly 147 miles, and the distance from head to mouth by a straight line would probably be 70 miles. During low stage of the river the influence of the lunar tides is felt probably as far up as 97 miles above Georgetown, which goes to prove that even the total fall of the river must of necessity be very little. At the flush-water periods, however, there is a constant fluvial current for the most part, though there may be a slight swell of the flood for some distance up the river.

"There is very little current on the lower Waccamaw, but a greater velocity on the upper portion of the river is found. This stream flows through a cypress and juniper timbered land, which imparts to its waters a dark hue, but the water is said to be very pure and healthy.

"The soil along the river is well adapted to the production of cotton, corn, potatoes, rice, and various fruits. The lands generally are well and richly timbered. It is thought that there is no river in this State better suited to free, safe, and easy navigation than this. The Waccamaw may at some future day form a link in the chain of the proposed 'inland water route' along the Atlantic coast. Capt. Charles B. Phillips refers to the possibility of this in a report of his to the Chief of Engineers in 1880 concerning this river, and adds that this same thing was mentioned over forty years previous to that time by Lieut. Col. James Kearney, Topographical Engineers."

HISTORY OF EXAMINATIONS.

The first of these, of which there is any record known to this office, was authorized in the year 1805 by an act of the South Carolina legislature, appointing a board of commissioners, whose duty it was to ascertain, by examination, the cost of the improvement of the river from the mouth of Bull Creek to the North Carolina State line. No report could be found giving the result of this examination.

The next examination, of which this office has any record, was made by act of March, 1879, or after a lapse of seventy-two years, by Capt. Charles B. Phillips, Corps of Engineers, U. S. Army (see Annual Report of the Chief of Engineers for 1880, p. 848, where details are given). As a result of the examination Captain Phillips recommended an expenditure of $29,370, and speaks of the amount as being "certainly moderate, considering the length of the river and the great advantages to commerce which would attend the improvement."

The plan of the improvement as embodied within the project, formed from information collected in this examination, provided for a channel 12 feet deep from Winyah Bay to Conwayborough, now called Conway, and above that place a channel simply cleared of obstructions, the former to be secured by dredging, the latter by snagging. The engineer officer speaks of the hurried manner in which the examination had to be made, because of the limited time and money he had at his disposal for this purpose, and implies that his assistant engineer's report was not as thorough as it would have been under more favorable circumstances.

In the year 1883 the river was examined by Capt. James Mercur, Corps of Engineers, U. S. Army, in person between Lake Waccamaw and Conway (for details, see Report of the Chief of Engineers for 1884, beginning on p. 1056). This officer speaks of "there being absolutely no through traffic upon this river" at that time, but gives an approximate list of shipments between Star Bluff and Conway. He made no alterations in Captain Phillips's estimate for the improvement of the stream.

Capt. W. H. Bixby, Corps of Engineers, U. S. Army, examined the entire length of the river from Lake Waccamaw to Georgetown in the year 1886, revising and increasing the original estimate, and recommending that $138,400 be expended in the future improvement of the stream, and stated that the yearly commerce actually carried over its channels was worth $1,300,000 (for details, attention is invited to Annual Report of Chief of Engineers for 1886, beginning on p. 1022). This amount probably included a portion at least of the Great Pedee River freights, which pass over a part of the Waccamaw, to get them to Georgetown.

By direction of the engineer officer then in charge of the district, the undersigned made a rapid, inexpensive survey of the river from Lake Waccamaw to Georgetown, in the year 1887, for the purpose only of completing a map of the shore lines of the stream, so as to form some idea of distances more correctly than by guessing at them, which had been the previous practice, for reproduction of same (see Annual Report of the Chief of Engineers, p. 1200).

While of course the map never was considered as being thoroughly accurate, still it was better than none at all, and filled the requirements at that time. There was no attempt made at forming new estimates or correcting old ones by this survey; neither was anything of a commercial nature investigated.

* * * * * * *

In the year 1884, by direction of Capt. W. H. Bixby, Corps of Engineers, U. S. Army, the undersigned completed surveys of quite a detailed nature of all shoals between Conway and the mouth of the river at that time interfering with the navigation of the channels. Estimates were made from those for increasing the depth of the river, but it has been many years since then and so many changes have probably occurred in the bed of the stream that it would probably not be practicable now to use the figures made then.

The next examination is the one ordered in your letter of July 31, 1902, of which this report specifically treats, and after giving a brief history of the improvement of the river, this report will follow for your consideration.

HISTORY OF WORKS OF IMPROVEMENT.

The oldest account which could be found relating to the improvement of the Waccamaw River was in the year 1778, being an act of the South Carolina legislature providing for the improvement of the river from the North Carolina line to Holders Bluff, the work to be done by the male inhabitants of the country along the river, each of whom was to serve in this way twelve days in the year.

The next attempt was made in the year 1783, by an act of the legislature providing for improvements between points and in the same manner as mentioned above.

No record could be found of any attempt to improve the river from 1783 to the year 1880, when the United States Government appropriated $15,000 for the work. Since then operations have been carried on at intervals, as appropriations became available, much benefit being done to the growing commerce, but very much was necessarily left undone because of the meagerness of the appropriations and periods of time between their availability.

SPECIAL EXAMINATION OF THE RIVER JUST COMPLETED.

The most important commercial section of the river was passed over on a steam launch, and all the principal shipping points were visited for the purpose of collecting commercial statistics by direct examination of the freight record books.

The river was found to be in good, serviceable condition from Georgetown to the mouth of Bull Creek, 22½ miles; farther up, to Bucksville, 12½ miles, there are several shoal places and many log obstructions, but the depth is probably not more than 10 feet at mean low water. A short distance below Bucksville (3 miles) there is a sharp bend known as "Big Needle Eye," which is obstructive to navigation and should be cut off in the general improvement of the river. Beyond Bucksville to Conway, 15 miles, a growing, thrifty town of about 1,500 inhabitants, and having excellent railroad connections, being the principal shipping point on the river, numerous shoals are found as well as many obstructions, such as logs, snags, and overhanging trees, and the river grows narrower and more tortuous than below, with a controlling depth of probably 3 feet at mean low water, the worst place being known as Coxs shoal, where steamers are delayed at every low water.

A number of cut-offs might be made with advantage and economy along this section of the river, as well as above Conway, which would straighten the channel and obviate the necessity of dredging some of the shoals.

Above Conway the river is more obstructed than below, and is shallower, the controlling depth being not more than 1 foot at mean low water, and is badly obstructed by logs and fallen timber.

Past operations on this stream have been confined exclusively to snagging and clearing banks, except that in the very beginning of the improvement, twenty years ago, an attempt was made to deepen some of the shoals below Conway by a system of pile and brush jetties; but as it was discovered after making this experiment that they would probably not accomplish the object in view, their further construction was abandoned, and it was determined to have recourse to dredging in making future efforts to deepen Waccamaw River. The appropriations made from time to time, however, being even inadequate to maintain a snagged channel, no dredging could be done. The appropriations under the estimate for the completion of the project were gradually used up in the struggle of the Engineer Department to provide and maintain simply a snagged channel, so that the boats might be allowed to run during the flush-water period.

COMMERCE.

The commerce is at present carried on above Conway, when the water is high enough to permit their running, by two side-wheel steamers of 283 and 89 tons, respectively, and a steam launch of 4 tons, towing a deck lighter. In addition to these there are pole flats and rafts. The larger of the side-wheel boats operates as high up as Red Bluff, 74 miles from the mouth, and the others go a great deal farther than that, depending upon the stage of the water, reaching at times to at least Reaves Ferry, North Carolina, 117 miles above the mouth.

Rafting of timber is done at times all the way from that point to Lake Waccamaw, so it is said. Below Conway the commerce is carried on by these same steamers, together with those and other craft shown on accompanying list.

The following commercial figures were obtained in the most reliable manner possible, freight shipping books having been examined in person, shipping agents and traffic managers questioned, and every effort made to get same correctly, for fiscal year ending June 30, 1902, and are not believed to be overestimated. They represent the freights that are actually carried over and belong strictly to the Waccamaw River, in its commercial development. The discrepancy which appears between these figures and those shown in the annual reports for the Waccamaw is caused by Captain Dusenbury, who furnished these annual statements, including in the Waccamaw the Great Pedee River freights, which have to be carried over, in part, the lower portion of the Waccamaw River to get them to Georgetown.

The separation is made in this report so as to cause the Waccamaw River commerce to stand distinctly and definitely on its own merits. People generally are under the impression that the Waccamaw River ought to be given credit for the Great Pedee freights passing over it, because to get them to Georgetown via the Great Pedee River proper would require a very large amount to be expended to improve that river to its mouth near Georgetown.

Commercial statement.

	Tons.	Value.
Outward freights	112,581	$1,060,837
Inward freights	6,750	576,310
Total	119,331	1,637,147
30,134 steamboat passengers, fares		5,766
		1,642,913

Of the foregoing, 40,343 tons of outward freights, valued at $99,946, and 396 tons inward freights, valued at $39,520, can be said to belong properly to the river above Conway, and the balance should be assigned to the river below that town.

PROSPECTIVE COMMERCE.

In regard to the prospective commerce, should the river be improved so as to permit the traffic to continue uninterruptedly throughout the year between certain points, it is exceedingly difficult to make any positive forecast as to what the probable amount of that would be. As the trade and commerce have steadily become more permanently fixed on the river since the beginning of governmental improvements, no reason is known why it should not now increase at a reasonable rate should the river be improved in depth to permit navigation as stated. The people living along this river seem to be prospering, towns are improving, new lands are being cleared, and the country being more thickly settled.

Those who are best acquainted with the commercial possibilities of the Waccamaw country estimate that, should the Government decide to carry out the improvements as mentioned above, the commerce would soon increase at least 50 per cent as a result of the work, and no reason is known to the undersigned why it should not do so. A very considerable portion of this increase will be on the river above Conway.

Transportation facilities furnished by the river, which the people could rely upon, would probably cause new industries to spring up and in every way encourage the development of the resources of the fertile lands and different kinds of timber within reach of the river and on each side of it.

The depths of channel probably required to comply with the existing commercial demands are 12 feet at mean low water from Georgetown to Conway, with not less than 80 feet width; 6 feet same stage of water from Conway to Red Bluff, width 50 to 60 feet; Red Bluff to Wortham's bridge, same stage of water, depth 3 feet, width 40 feet. At present, from Wortham's bridge to Lake Waccamaw, a channel to be cleared only of logs, snags, and overhanging trees.

The estimate of the probable cost of completing this improvement which follows is approximate only and is not intended for use to base any calculation on in the formation of projects, but only to furnish some idea as to the probable cost to the United States for completing this improvement, so that comparisons might be made between the money value of this and that of the commerce, present and prospective, in order that a definite conclusion might be reached as to whether or not the river is at this time worthy of a detailed survey, the object of the survey being to secure information from which to form a reliable estimate of the cost of the improvement as stated.

Estimate.

Below Conway, providing for a depth of 12 feet at mean low water:	
274,815 cubic yards dredging shoals, at 15 cents per cubic yard	$41,222.25
166,666 cubic yards cut-offs to be dredged, at 20 cents per cubic yard	33,333.20
Twelve months' work of snag boat, at $500 per month	6,000.00
	80,555.45
Above Conway, to Red Bluff, 6 feet at mean low water:	
31,111 cubic yards dredging shoals, at 15 cents per cubic yard	4,666.65
18,518 cubic yards cut-offs, at 20 cents per cubic yard	3,703.60
Ten months' work of snag boat, at $500 per month	5,000.00
	13,370.25
Red Bluff to Wortham's bridge:	
35,200 cubic yards dredging shoals, at 15 cents per cubic yard	5,280.00
20,000 cubic yards cut-offs, at 20 cents per cubic yard	4,000.00
Eighteen months' work of snag boat, at $500 per month	9,000.00
	18,280.00
Wortham's bridge to Lake Waccamaw:	
Twenty-four months' work of snag boat, at $500 per month	12,000.00
Add 10 per cent for superintendence and contingencies	12,420.57
Total	136,626.27

After this expenditure it will probably require $6,000 to $8,000 a year in maintenance.

Taking all the foregoing into consideration, the Waccamaw River is deemed at present worthy of improvement to this extent.

It is therefore recommended that the river be surveyed from Lake Waccamaw to the mouth of Bull Creek, and that the following general plan for this work be adopted:

Lake Waccamaw to Seven Creeks: No instrumental work be attempted, but that some reliable person be sent over the river to get as accurate account as possible of such obstructions as logs, snags, overhanging trees, etc. The map of the Waccamaw River now in the files of the Engineer Department (see p. 1200, Annual Report of the Chief of Engineers for 1889) will answer the purpose for this portion of the river, as no absolutely correct map of a river where snagging only is done is required. Under the present existing circumstances the time is so limited that to attempt to accurately survey and map the whole river might result in none of it being finished as thoroughly as it should be for basing estimates for dredging, etc.

It is therefore recommended that as careful instrumental work be finished as time will allow between "Seven Creeks" and mouth of Bull Creek, the preference of this work being given to that portion between Wortham's bridge and Bull Creek, the soundings on the map to represent mean low water. It is not recommended that any surveying from Bull Creek to the mouth of the river at this time be undertaken.

It is estimated that about $1,500 will be required to survey, sound, and map the river in sufficiently accurate manner for the purpose of making reliable estimates for the river's improvement.

The development of the survey may show that to extend the dredging to Seven Creeks (about 13 miles above Wortham's bridge and 2 miles above Pireway Ferry) would increase the estimate very little. If that proves to be the case, it is respectfully recommended that this extension be made for the upper limit of the dredging, as Pireway Ferry is considered an important shipping point.

Very respectfully, your obedient servant,

Reid Whitford,
Assistant Engineer.

Capt. J. C. Sanford,
Corps of Engineers, U. S. A.

SURVEY OF WACCAMAW RIVER, NORTH CAROLINA AND SOUTH CAROLINA.

United States Engineer Office,
Charleston, S. C., December 8, 1903.

General: In compliance with instructions contained in letter from Office Chief of Engineers, United States Army, July 22, 1903, I have the honor to submit the following report upon a survey of the Waccamaw River, South Carolina, below Conway, with estimates of cost for channels 6, 9, and 12 feet deep, respectively. The survey was made in November, 1903, under the supervision of Asst. Engineer Reid Whitford, at Georgetown, S. C., who also prepared the estimates. His report is appended.

The survey covers the river between the mouth of Bull Creek, 23 miles above the mouth in Winyah Bay, and Conway, a distance of 26½ miles. Below Bull Creek the channel depth is 12 feet and over, requiring no survey. The Great Pedee River is only a short distance to the westward, and the two streams are connected by several creeks, Bull Creek being the first and the largest. The commerce of the Great Pedee is carried through Bull Creek to the Waccamaw River and thence to Winyah Bay.

Above Bull Creek the character of the river changes. It has less width and numerous sharp bends. The water is black and carries no silt. The banks are covered with trees—cypress, gum, and the like—and there is no erosion. Tidal influence extends 30 miles above Conway, the daily rise and fall at Conway being from 2 to 3 feet. In times of freshet the maximum height at Conway is about 8 feet above low water. Owing to this gentle slope, dredging and making cut-offs will have no deleterious effects on the river, and the improvement will last for years.

The principal cut-offs are at Needles Eye (mile 9, sheet 2), Thoroughfare Creek (mile 17, sheet 4), and Burroughs (mile 25, sheet 5). The cut-off shown on sheet 5, between miles 23 and 24, will not be made. For reasons stated in Mr. Whitford's report, the line marked "X-X" is selected at Thoroughfare Creek. A cut-off at this place involves, for a 12-foot channel, only 16,000 cubic yards more dredging than in the river proper. The other places where cut-offs are recommended are at points in the river where navigation is difficult on account of the sharp bends, especially to the side-wheel steamers, 125 feet long, that ply on the river.

Allowing for the dredging in the river proper that will be avoided by making the cut-offs, the estimates for a channel 100 feet wide are as follows:

Six-foot depth:	
Dredging in river proper, 14,588 cubic yards, at 12 cents	$1,750.56
Cut-offs, 197,866 cubic yards, at 18 cents	35,615.88
Contingencies, about 10 per cent	2,633.56
Total	40,000.00
Nine-foot channel:	
Dredging in river proper, 124,855 cubic yards, at 12 cents	14,982.60
Cut-offs, 265,426 cubic yards, at 18 cents	47,776.68
Contingencies, about 10 per cent	7,240.72
Total	70,000.00
Twelve-foot channel:	
Dredging in river proper, 397,624 cubic yards, at 12 cents	47,714.88
Cut-offs, 333,703 cubic yards, at 18 cents	60,066.54
Contingencies, about 10 per cent	12,218.58
Total	120,000.00

A 12-foot channel will enable seagoing vessels and barges to load up the river and go to sea without breaking bulk at Georgetown. The original project, made in 1880, provided for a 12-foot channel to Conway, and since then sawmills have sprung up along the bank, sending to market yellow-pine lumber, cypress shingles, etc. Schooners drawing from 8 to 12 feet already ply on the lower stretches of the river, and there is reason to believe that, with sufficient water, they would go to the mills higher up. The 6-foot channel would enable the side-wheel steamers that now run on the river to have good water at all times, especially in the low-water period when cotton is moving.

There is not much necessity for a 9-foot channel, as the river steamers do not require it and it is not enough for seagoing vessels.

It is recommended that the original project for a 12-foot channel to Conway be maintained and that the cost be placed at $120,000.

Attention is invited to the fact that up to mile 13 and a little beyond Bucksville very little dredging is required for a 12-foot channel. Bucksville is the last settlement of any size along the river until Conway is reached. The cost of a 12-foot channel to Bucksville and a 6-foot channel beyond to Conway will be as follows:

Twelve-foot channel from Bull Creek to mile 13	$15,000
Six-foot channel from mile 13 to Conway	35,000
Total	50,000

This modified plan is recommended if the 12-foot channel all the way to Conway is not adopted.

It is estimated that the annual cost of snagging on the river above Conway will be $5,000.

G. P. HOWELL,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE OF THE DIVISION ENGINEER, SOUTHEAST DIVISION,
Savannah Ga., December 11, 1903.

Respectfully submitted to the Chief of Engineers.

In view of the very great cost of a 12-foot channel to Conway, it is not believed that the conditions fully justify such an improvement.

A 9-foot channel is not deemed of sufficient value to warrant its construction, as it is too shallow for seagoing vessels and unnecessarily deep for river steamers.

Above the 13-mile point the river changes its character materially, and it is believed that a 12-foot channel up to this point and a 6-foot channel from this point to Conway would be all that would be justified by present commercial conditions. Such improvement can be effected for $50,000, and is recommended, as it is considered to be worthy.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., December 4, 1903.

CAPTAIN: To comply with directions contained in your letter of July 25, 1903, I have the honor to make the following report of the survey of the Waccamaw River, with a view of forming estimates for channels from Conway to the mouth 6, 9, and 12 feet deep at mean low water, channel width adopted being 100 feet.

The survey was confined between the mouth of Bull Creek and Conway, the former place being 23 miles from the mouth of the Waccamaw River, at Georgetown, and the latter place 26⅗ miles above the creek.

The survey was made with a Heller & Brightly transit, using compass bearings and stadia measurements. The mean low-water level was determined by averaging all of the low-water readings on the standard gauge at Conway, S. C., for the past eleven years, beginning with 1893. The soundings were all reduced to this place of reference and were taken on lines as shown on accompanying tracing (in 5 sheets). Scale, 1 inch=500 feet.

The map could not well have been made on a smaller scale to show sufficient detail.

It will be observed that the river becomes quite crooked above Bull Creek, its tortuosity increasing as Conway is approached. As a matter of fact, the river is difficult of navigation up that way by the steamers at present engaged in carrying on the traffic of the stream by the numerous short bends occurring in quick succession to each other. The depth is fairly good up to mile 14, miles being numbered from mouth of Bull Creek.

Above mile 14 the river shoals considerably, the shallowest place being at what is known as Coxs shoal, where the depth is only 3½ feet at mean low water.

As full information concerning this stream, both as to its physical features, history of its past surveys and improvements, and importance of its yearly commerce, were given in full in the preliminary examination report dated August 15, 1902, and already forwarded to your office, nothing of interest relating to these subjects can be added to this report. Aside from that, other important data relating to the commercial value of the Waccamaw River was presented to the Board of Engineers which convened in this office June 18, 1903.

Therefore this report will mainly deal with estimates for dredging in the proposed improvement of the stream and such recommendations as may be thought advisable to form a project for deepening the Waccamaw River to Conway, which seems to be urgently needed, in order that the commerce may be expanded in that growing and prosperous country.

It is believed that a number of cut-offs can be made to marked advantage in the proposed improvement, and especially is this the case as shown on sheet 4, at Thoroughfare Island, via Thoroughfare Creek. Other cut-offs and "point dredging" are also indicated by full lines at intervals, which can be observed by looking over each sheet of the map.

Estimate for 6-foot depth at mean low water, confining the proposed lines of dredging strictly to the river proper and avoiding all cut-offs, width 100 feet:

16,748 cubic yards material, at 12 cents	$2,009.76
Add 10 per cent for superintendence and contingencies	200.98
	2,210.74

Estimate for 9-foot depth at mean low water, confining the proposed lines of dredging strictly to the river proper and avoiding all cut-offs, 100 feet width:

152,289 cubic yards material, at 12 cents	18,274.68
Add 10 per cent for superintendence and contingencies	1,827.47
	20,102.15

Estimate for 12-foot depth at mean low water, confining the proposed lines of dredging strictly to the river proper, and avoiding all cut-offs, 100-foot width:

550,480 cubic yards material, at 12 cents	66,057.60
Add 10 per cent for superintendence and contingencies	6,605.76
	72,663.36

Estimates for 6, 9, and 12 foot depths, via river and cut-offs:

	Cubic yards.
Sheet 2 of map, station 147—	
6-foot depth	9,900
9-foot depth	12,600
12-foot depth	15,300
Sheet 3 of map, stations 137 and 138—	
6-foot depth	9,370
9-foot depth	11,926
12-foot depth	14,481
Sheet 2 of map, points at stations 174 and 177—	
6-foot depth	16,083
9-foot depth	20,481
12-foot depth	24,870
Sheet 4 of map, points at stations 86, 84, 83, X-X Thoroughfare cut—	
6-foot depth	115,295
9-foot depth	154,516
12-foot depth	193,739
Sheet 5 of map, points at stations 38, 32, 31, 30, 25, 15, 12—	
6-foot depth	69,218
9-foot depth	103,236
12-foot depth	136,313

Total for river channels and cut-offs:

6-foot depth—	
219,866 cubic yards, at 18 cents	$39,575.88
16,748 cubic yards, at 12 cents	2,009.76
	41,585.64
10 per cent for superintendence and contingencies	4,158.56
	45,744.20

Total for river channels and cut-offs—Continued.	
9-foot depth—	
302,759 cubic yards, at 18 cents	$54,496.62
152,289 cubic yards, at 12 cents	18,274.68
	72,771.30
10 per cent for superintendence and contingencies	7,277.13
	80,048.43
12-foot depth:	
384,703 cubic yards, at 18 cents	69,246.54
550,480 cubic yards, at 12 cents	66,057.60
	135,304.14
Add 10 per cent for superintendence and contingencies	13,530.41
	148,834.55
Estimate, same as above, with the exception only of following the river to the right of Thoroughfare Creek and excavating only such cut-offs as shown, at stations 66, 70, 75, and 78, and Jacksons Bluff:	
6-foot depth—	
220,273 cubic yards, at 18 cents	39,649.14
16,748 cubic yards, at 12 cents	2,009.76
	41,658.90
Add 10 per cent for superintendence and contingencies	4,165.89
	45,824.79
9-foot depth—	
295,500 cubic yards, at 18 cents	53,190.00
152,289 cubic yards, at 12 cents	18,274.68
	71,464.68
10 per cent for superintendence and contingencies	7,146.47
	78,611.15
12-foot depth—	
369,777 cubic yards, at 18 cents	66,559.86
550,480 cubic yards, at 12 cents	66,057.60
	132,617.46
10 per cent for superintendence and contingencies	13,261.75
	145,879.21

The saving in distance by the cut-off X-X at Thoroughfare Creek is 2½ miles, avoiding the most crooked portion of the river and that most difficult of navigation.

The excess of cost by the Thoroughfare Creek route over the other by 9-foot depth is about $1,800, and for the 12-foot depth is about $3,600, and for the 6-foot depth is practically the same.

The cut-off Y-Y at Thoroughfare Creek is not considered because of its excessive cost.

The object of improving the Waccamaw River to Conway for any depth over 6 feet is to permit seagoing vessels and barges to be towed up as high as that place and load them with lumber, shingles, and other heavy freights direct for an ocean voyage, via Winyah Bay, without breaking bulk.

It would be exceedingly difficult, if not next to impossible, to tow around the crooked bends in the river to the right or east of Thoroughfare Creek without making the cut-offs as indicated on the map.

Conway is a growing town and a center of a very large lumbering country, and with 12-foot navigation at mean low water from its wharves to the ocean will probably in a short time develop into a large shipping port for such commodities as lumber, shingles, and the like, which would not bear being brought down on lighter craft and rehandling in loading to deeper seagoing vessels at Georgetown because of the extra expense thus incurred.

To provide a 6-foot navigation the river would be of somewhat more general use than it is at present. A 9-foot depth would be still more so, but neither would be sufficient to accommodate the draft of seagoing craft. Twelve feet might be sufficient to accomplish that, but it would not be any too much.

The original project, made in 1880, for improving the river provided for a 12-foot depth to Conway, and was made by Capt. Charles B. Phillips, Corps of Engineers, U. S. A., which shows as far back as then that the river was considered worthy of improvement to that depth, and if then it was of sufficient commercial importance to require that depth it is now a great deal more worthy of such improvement, taking into consideration the general advance and progressiveness of the country, increase in population, and the demands for better transportation facilities and cheaper rates.

For reasons given it is therefore recommended that the original project of 12-foot depth to Conway be adhered to, and the route adopted be via the cut-offs shown on the map, including that one at X-X, on Thoroughfare Creek, at a total approximate cost of $148,834.55.

The land through which the cut-offs are to be made is flat swamp, about 5 feet above low water, covered with original growth of cypress, gum, and the like, all of which can be dredged by modern machinery without blasting, and the excavations deposited on either side of the cut. The excavated material from the river can be disposed of in some instances by dumping on the adjacent banks and in others by towing off in dump lighters and deposited in near-by lakes and arms of the river.

There are often months in each year when the water level is controlled by lunar tides as far as 30 miles above Conway, the daily rise and fall at Conway being from 2 to 3 feet, owing to prevailing winds on the lower river. The mean range in tide at Georgetown, about 49 miles below Conway, is about 4 feet.

The fall of the Waccamaw is very little, the current sluggish even when the river is in freshet, and when this is the case the maximum height at Conway is probably 8 feet above low water. Because of the gentle slope of the stream it is believed that the cut-offs can be made with satisfactory results and without danger of increasing the velocity of the current to such an extent as to cause any erosion of the banks. The river being a black-water stream, carrying no silt, it is thought that the channel once dredged would require no maintenance by redredging for a number of years.

The amount of commerce on the Waccamaw River for the calendar year 1902, as reported and printed, was 141,686 tons, valued at $1,844,019, belonging to the Waccamaw River proper, without anything from its neighboring river, the Great Pedee, whose entire commerce is carried over the lower part of the Waccamaw.

This commerce in detail can be seen on page 1118, and list of vessels engaged in the traffic on page 1119, of the Annual Report of the Chief of Engineers for 1903.

Bench marks securing the mean low-water plane and stations securing the transit line were permanently established along the river.

It is estimated that in addition to the foregoing about $7,200 will be required yearly for snagging operations above Conway.

Much credit is due Mr. William H. Johnstone, surveyor, for valuable assistance rendered in efficiently completing the field work.

Very respectfully, your obedient servant,

Reid Whitford,
Assistant Engineer.

Capt. G. P. Howell,
Corps of Engineers, U. S. A.

N 19.

PRELIMINARY EXAMINATION OF WATEREE RIVER, SOUTH CAROLINA, FROM ITS MOUTH UP TO CAMDEN.

[Printed in House Doc. No. 185, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith report dated April 18, 1903, by Capt. J. C. Sanford, Corps of Engineers, on preliminary examination of Wateree River, South Carolina, from its mouth up to Camden, ordered by the river and harbor act of June 13, 1902, which directed that, until further action by Congress, improvement of said river be suspended.

The present project for improving the Wateree is practically the maintenance of 4-foot navigation for steamboats up to Camden, and it is the opinion of Captain Sanford, concurred in by the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers, that the locality is worthy of improvement to that extent, but that funds should be expended on the work only when there is an immediate prospect of a cleared channel being needed for navigation.

The Board of Engineers for Rivers and Harbors has reviewed this report in accordance with the provisions of sections 3 and 14 of the above-mentioned act, and a public hearing has been held to afford interested parties an opportunity to express their views; and for reasons given in its report of July 9, 1903, the Board expresses the opinion that work on this stream should not be undertaken until the anticipated increase of commerce on the Santee and Congaree has come about. The Board regards the Santee River system, including the Congaree and Wateree and the Estherville-Minim Creek Canal, as a unit and recommends that future appropriations for maintenance of this system of waterways be made in terms that will permit work to be done wherever required by the immediate demands of commerce and the condition of the channel.

I concur in the views of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. J. C. SANFORD. CORPS OF ENGINEERS.

United States Engineer Office,
Charleston, S. C., April 18, 1903.

General: I have the honor to submit the following report upon a preliminary examination of Wateree River, South Carolina, from its mouth to Camden, in accordance with the requirements of the river and harbor act approved June 13, 1902; the item directing the examination containing also the provision, "And until further action by Congress improvement on said river is suspended."

The Wateree River proper is formed by the junction of the Catawba River and Wateree Creek, in the north-central part of South Carolina. As the Catawba is by far the larger of these two tributaries, the Wateree is practically only a continuation of the Catawba, a long river rising in the extreme western part of North Carolina. Camden, the most important town on the Wateree River, is about 68 miles above the mouth and is generally considered the head of navigation. The population of Camden by the census of 1900 was 2,441; but there is also a considerable population, made up partly of permanent and partly of winter residents in an unincorporated suburb called Kirkwood, of which no separate census was taken. The Wateree River at its mouth unites with the Congaree River, forming the Santee, the largest river of South Carolina.

A preliminary examination of the Wateree River was made in 1880 under Capt. Charles B. Phillips, Corps of Engineers (printed in Annual Report, Chief of Engineers for 1880, pp. 914–916). From Camden to the mouth a least depth of 3 feet at low water was found, but numerous snags, fallen and overhanging trees, etc., were found. A light-draft steamboat was then plying on the river, as well as flatboats and rafts. Captain Phillips recommended the removal of snags and similar obstructions from Camden to the mouth, at an estimated cost of $30,000.

In the fall of 1880 a survey was made under Captain Phillips and an estimate for improvement from Camden to the mouth (printed in Annual Report, Chief of Engineers for 1881, pp. 1034–1036). The improvement proposed consisted of removal of snags, etc., and the cutting off of five projecting points, the estimated cost being $54,000. But few places were found where the low-water depth was less than 4 feet. In Assistant Engineer Darling's report, which Captain Phillips appends, the population of Camden is given as "upward of 3,000." The first appropriation for work under this project was made in 1881.

In 1885 the estimate was raised by Capt. W. H. Bixby, Corps of Engineers, to $58,000 (Annual Report, Chief of Engineers for 1886, p. 1054), and in 1888 to $60,000 (Annual Report, Chief of Engineers for 1888, p. 939). In his annual report for 1888 (printed as per last above reference) Captain Bixby gives a full history of the work to that date, with results obtained and recommendations for future work. The following extracts are from that report:

> *Results.*—Up to June 30, 1888, a total of $34,660.98 has been spent in all upon this improvement, giving a thoroughly cleared 4-foot navigation at all stages of water from the mouth of the river 11 miles upward, and thence a fairly well cleared 4-foot navigation over the rest of river, 57 miles, to Camden.
>
> In consequence of this improvement a steamboat line would have been permanently established upon the whole length of the river had it not been prevented by the obstructions offered by two railroad bridges. As soon as obstructions be removed a river commerce of $1,000,000 of transported goods per year will probably be at once developed. A personal inspection of the river over its entire length, in 1885, showed the agricultural richness of the river basin, its urgent need for water transportation facilities, and the worthiness of the improvement.
>
> * * * * * * *
>
> *Recommendations for future work.*—It is recommended that this improvement be completed in accordance with the present improved and adopted project, so as to secure a thoroughly cleared 4-foot navigation over the entire river at all stages of water, at a total expense of $24,500 in addition to the funds available June 30, 1888; this amount to be appropriated in one sum during the next year. Smaller yearly appropriations may increase the cost of the work by from $1,000 to $4,000 per appropriation.
>
> Further improvement, so as to extend the navigation above Camden or to deepen that below Camden, is not recommended.
>
> It is strongly recommended that the South Carolina Railroad, and Wilmington, Columbia and Augusta Railroad be required to put a drawspan in their bridges across the river.
>
> After the improvement is finished its proper maintenance may cost from $1,000 to $3,000 per year.

In the Annual Report, Chief of Engineers for 1889, page 1191, the following statement is made:

> There is still no navigation on the Wateree, nor will there be till the drawbridges shall have been finished.

The last of these bridges was provided with a draw in February, 1890. During the spring of that year a steamboat made several trips on the river.

The Annual Report, Chief of Engineers for 1891, pages 1462–1463, contains the following:

> *Work of past year.*—The river was quite thoroughly cleared by plant owned and operated by the United States, for a width of 80 feet and depth of 4 feet at low water between points no miles and 68 miles above the mouth. * * *

Remarks.—Two steamers have been running regularly on this river during the year. Parties using the river report much benefit from the work done by the United States. The appropriation of September 19, 1890, completes the amount that this improvement was estimated to cost. By the expenditure of this sum the entire portion of the river covered by the project has been put into good condition for steamboat navigation. For its maintenance the snag boat owned by the river should be kept at work continuously. The stream is well worth this expense, which would amount to about $6,500 a year. If appropriations are made every two years, $13,000 could be advantageously spent in that period.

The commerce for that year was 1,005½ tons.

The Annual Report, Chief of Engineers for 1892, page 1215, states:

Work of past year.—The river was quite thoroughly cleared by plant owned and operated by the United States, for a width of 80 feet and depth of 4 feet at low water, between points no miles and 67 miles above the mouth.

The commerce for that year was 2,244 tons.

For the fiscal year 1893, the river is reported as in good condition for steamboat navigation. The freight passing over the stream in that year aggregated 6,242 tons.

During the fiscal year 1894, but little snagging was done. The commerce passing over the river is reported as 18,075 tons, of which 16,000 tons consisted of cypress logs.

In the fiscal year 1895 no snagging was done. Commerce reported as 21,697 tons, 20,000 tons being timber.

In the fiscal year 1896 snagging was done on the lower 9½ miles of the river only. Commerce reported, 35,002 tons; 30,000 tons being timber.

During the fiscal year 1897 it is stated that the channel was kept in good condition. Commerce, 43,770 tons; 40,000 tons being timber.

Some snagging was done in the fiscal year 1898. Commerce, 83,568 tons; 80,000 tons being timber.

During the fiscal year 1899 snagging was done on the lower 15 miles of the river. Commerce, 17,195 tons; 16,000 tons being timber.

Snagging was done in the fiscal year 1900. Commerce, 109,170 tons; 108,000 tons being timber.

Owing to small balance available, no snagging was done during the fiscal year 1901. Commerce, 93,024 tons; 93,000 tons being timber.

No work other than care and maintenance of plant was done during fiscal year 1902. The river and harbor act approved June 13, 1902, appropriated $27,000 for improving the Santee, Wateree, and Congaree rivers. As the above river and harbor act provides for a preliminary examination of the Wateree River, with the proviso that "until further action by Congress improvement on said river is suspended," no further work will be done on the river until Congress so orders. Commerce for 1902, 10,417 tons; all timber.

From the above description of the river and history of the improvement and its results, it appears that, while the river has a good natural depth, and needs only the removal of snags, etc., to make steamboat navigation practicable and reasonably unobstructed, yet the considerable amount of work that has thus far been done toward the removal of obstructions and the maintenance of the cleared channel has had little effect in increasing commerce.

The Government has entered upon the improvement of the Congaree River from Columbia to its junction with the Wateree. The Santee having a good natural depth, this improvement may result in the establishment of regular steamboat navigation in the Santee and Congaree.

If it does, it would seem desirable that the Wateree also should be cleared of snags and similar obstructions, in order that boats on the Santee may reach either Columbia or Camden, as trade offers. This work, however, would simply be the maintenance of the already completed project for clearing the river.

The Wateree River is, in my opinion, worthy of improvement by the General Government to the extent of maintaining the formerly cleared channel to Camden, but in my opinion funds should be expended on this snagging work only when there is an immediate prospect of a cleared channel being needed for navigation. No survey is necessary.

Report of Assistant Engineer Reid Whitford on the preliminary examination of 1902 is appended.

Very respectfully, your obedient servant,

J. C. SANFORD,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Norfolk, Va., April 21, 1903.

Respectfully submitted to the Chief of Engineers, United States Army.

The conclusions of the district engineer are concurred in.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 25, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

Additional information has been called for if available.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 9, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of "Wateree River, from its mouth up to Camden," the indorsement of the division engineer thereon, and all other data available. On June 18, 1903, a committee of the Board held a public hearing at Georgetown,

S. C., at which interested parties were given opportunity to express their views with regard to this proposed improvement.

The Wateree, 67 miles long between Camden, S. C., and its mouth, and the Congaree, 49 miles long between Columbia, S. C., and its mouth, unite to form the Santee. The latter flows 184 miles southeasterly into the Atlantic Ocean. The Esterville-Minim Creek Canal connects the Santee near its mouth with Winyah Bay. A lock and dam are under construction immediately below Columbia upon the Congaree.

The Santee is regularly used as a route for commerce, shipments in 1901 aggregating 204,375 tons, valued at $1,809,000. It is expected that the completion of the Congaree lock will be followed by an extension of regular steamboat navigation to Columbia.

At present the Congaree and Wateree are used only for a rafting business. It is probable, however, that when steamboats ascend the Congaree to Columbia, the Wateree will also become a more useful water route, provided it be kept clear of snags.

Columbia and Camden are both manufacturing towns. They are situated at the upper limits of possible navigation upon waterways connecting them with the seaboard, and immediately below rapids well adapted to the development of water power.

The work needed upon the Wateree is one of snagging only, and is continuing in its nature. The Board is of opinion that this work should not be undertaken until the anticipated increase of commerce on the Santee and Congaree has come about. No survey is considered necessary. As estimates will be for maintenance only, they may be submitted by the district officer annually.

For transportation purposes the Santee River system, including the Estherville-Minim Creek Canal, may be regarded as a unit. It is recommended that future appropriations for maintenance of this system of waterways be made in terms that will permit work to be done wherever required by the immediate demands of commerce and the condition of the channel.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

REPORT OF MR. REID WHITFORD, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Georgetown, S. C., August 30, 1902.

CAPTAIN: In compliance with your letter of July 31, 1902, I have the honor to report as follows on the preliminary examination of Wateree River, South Carolina, from its mouth up to Camden.

The examination was made with the view of investigating the commercial importance of the river, present and prospective, in order that a decision might be reached, based on data thus obtained, as to whether the river was worthy of a detailed survey, looking to the formation of a new estimate and project for its further improvement.

GENERAL FEATURES.

The Wateree River is merely a continuation of the Catawba. The latter stream heads in McDowell County, N. C., near the main divide between the Atlantic and Mississippi basins. It runs thence first easterly then southerly, through portions of North and South Carolina, and takes the name "Wateree" at its junction with a small tributary creek of that name, entering from the west, in the upper portion of Fairfield County, S. C., some distance from the city of Camden. This place is at present the accepted head of navigation, and from there to the mouth of the Wateree, of which this report specifically treats, covers a distance of possibly 67 miles. At its lower end it mingles its waters with those of the Congaree River and forms the Santee. The latter continues on in a southerly direction for possibly 143 miles, and then empties its waters in the Atlantic Ocean probably 8 miles, in a southerly direction, from North Island light-house. The average width of the Wateree is said to be approximately 225 feet, and it is reported that there are few if any places between Camden and its mouth where there is less than 3 feet depth at ordinary low summer stage of water.

This stream possesses the advantage of being fed by mountain springs and does not depend entirely upon local rainfall for its supply.

It is said to be the deepest of all the upcountry rivers in South Carolina. How true this may be can only be determined by a careful survey made at a season of low water best suited for this work. It drains many miles of one of the most fertile sections in South Carolina.

At present the river is badly obstructed by snags, logs, and fallen timber, to such an extent as to really prevent anything like safe navigation of steamboats, except at freshet periods.

HISTORY OF EXAMINATIONS.

The first of these of which this office has any record was made in the year 1880, under the direction of Capt. Charles B. Phillips, Corps of Engineers, U. S. Army. (For his report, see p. 914, Annual Report of the Chief of Engineers for 1880.)

Captain Phillips speaks favorably of the improvement and recommends an expenditure of $30,000 for that purpose.

The next examination was made under the direction of the same officer, in 1881. (See p. 1034, Annual Report of the Chief of Engineers for 1881.) He still speaks in favorable terms of the river and recommends the expenditure of $54,000 for its improvement.

The next examination was the one authorized in your letter of July 31, 1902, provided for in river and harbor act of June 13, 1902, and to which this report relates.

HISTORY OF IMPROVEMENTS.

As far back as the year 1753 an attempt was made to improve the river, under the Colonial Government, means being provided to pay for it by levying a tax of 10 shillings on the hundred acres of land lying within 10 miles of the river, etc., owned and claimed by any person or persons who did not reside on the same, and that all the male inhabitants from the age of 16 to 60 years, living on either side of the river, etc., would be obliged to work at removing obstructions whenever the five commissioners appointed to look after the work called on them to do so.

In 1784 the assembly of the State of South Carolina appropriated the sum of £300 to remove obstructions as high up as Camden.

Five commissioners were appointed to look after the work, to put it out by contract or have it done otherwise, etc.

In 1785 an act was passed by the general assembly for clearing the Wateree, but no details are given.

In 1787 an act to establish a company for opening the Wateree and Catawba rivers, South Carolina, was passed.

In 1791 an act was passed to open and improve navigation of the Wateree River from the Falls at Mr. Chestnut's ferry down to the confluence of the Wateree and Congaree. Ten men were appointed to look after the work, and were known as the Wateree board of commissioners. The act specified that all male inhabitants between the ages of 16 and 50 years living within 6 miles of said river, etc., were made liable to work on the river, under the direction of said commissioners, for the space of six days in the year and no more.

In 1805 an act appropriated $2,000 for the improvement of the river from Camden Ferry to the Congaree River. The seven commissioners, whose duty it was to look after the work, were required to make yearly reports to the comptroller-general, explaining progress, etc.

On March 3, 1881, the United States Government made its first appropriation of $8,000 for the improvement of this stream, and after that date other appropriations were made periodically, which were expended in clearing the river of snags and fallen timber as provided for in the project; all of which is explained in Annual Reports of the Chief of Engineers, beginning in 1881, up to the present time.

The Wateree at one time was undoubtedly quite clear of obstructions between Camden and its mouth by the expenditure of governmental appropriations.

The difficulty, however, was, after clearing the channel, the yearly appropriations for maintenance were not sufficient to do that work, and as the river carries large quantities of drift in freshets, and because at such times some of its banks badly erode under action of the current, precipitating large trees into the water, the river became gradually so badly obstructed by the accumulation of different material that it was next to impossible for steamboats to be operated with sufficient regularity to comply with the growing demands of the commerce of the stream. As the shippers could not rely upon the boats running a regular schedule they of course could not keep their freights at a landing to await their uncertain arrival. As a natural consequence, freights were hauled overland and shipped by rail, and under the circumstances the boats of course ceased operations on the river.

The undersigned himself has known of a case where a planter kept a number of bales of cotton at a landing on the river for ten days, awaiting the coming of a steamboat, and at last had to haul by wagon and ship by rail. The foregoing were principally the reason why boats were taken off the river, and additional reasons are given why the old-time boats ceased running in the attached communication. Unquestionably the products within reach of the river and the demands for incoming supplies would develop a profitable traffic on this stream if it were cleared of obstructions and some of the shoals deepened to a comparatively slight extent, so as to permit steamers to run with regularity and dispatch. To accomplish the continuous success of this, the river channel would have to be yearly maintained, so as to furnish navigation for the steamers for every year at all stages of water.

COMMERCE.

At present there is no commerce annually carried in bottoms on the river for reasons given above. A considerable number of sawmill logs is rafted and drifted with the current, amounting yearly to about 16,600 tons, worth about $56,000. This amount would probably be increased with a thoroughly cleared river.

The prospective commerce is large. Just what it would amount to yearly with the river in an improved navigable condition it is exceedingly difficult to say.

After investigating the resources of the Wateree country from Camden to its mouth, within reach of the river and on either side of it, including the town of Camden, the conclusion has been reached that there are 48,490 tons of outward freight, consisting of farm products, including cotton and manufactured cotton goods, which would seek transportation in bottoms and rafts, with a marked tendency to increase in volume as a transportation line became reliably established, valued at $929,500; and 10,100 tons of inward freights, consisting of farm supplies, manufactured goods, fertilizers, etc., valued at $276,500; a total of 58,590 tons, valued at $1,206,000. These figures are based upon information furnished by a committee of the board of trade of Camden, of which Mr. C. J. Shannon, jr., one of the most prominent, enterprising, and active business men of the town, is president, and from other sources.

Of the foregoing amount the board of trade committee on commerce and navigation state that 41,990 tons, valued at $1,150,000, would most undoubtedly become immediately the yearly commerce carried on the Wateree River in bottoms should the river be improved by the General Government to a reliable depth of 4 feet at summer stage of low water.

These gentlemen further say that to prove the truth of their statement they themselves will put a line of first-class light-draft new steamers on the Wateree River as soon as the channel has been so improved as to permit them to run regularly, and that they themselves will undertake to guarantee to the steamers immediately a yearly freight of 21,000 tons, valued at $575,000, provided that the United States Government maintains the improvement yearly after it has once been made. It is firmly believed by the undersigned that these gentlemen are in earnest and will do exactly as they promise. They are all men of means, high character, perfect responsibility, and prominent in business.

The undersigned, from his general knowledge of the Wateree country, covering a period of a number of years, sees no reason to doubt the statements made by these gentlemen, and there is no information he could obtain, except possibly by months of research, which could be considered more reliable than that they have given. He is of the opinion that these gentlemen have been inclined, for fear of making a false statement, to underestimate the value of commerce rather than overestimate it.

Relating to this subject there is a statement from the board of trade of Camden forwarded herewith.

Camden is the most important place on the river, with a population of 6,000, including suburbs, and approximate yearly commerce of $5,000,000, which is on the increase. It is quite a railroad center, four railroads running in and out of the town, with connections in every direction.

Rail freights are said to be excessively high. Steamboats operated on the Wateree River would no doubt cause a reduction in these rates to meet those much lower by water. This would of itself be a great saving to the shippers.

* * * * * * *

Very respectfully, your obedient servant,

Reid Whitford,
Assistant Engineer.

Capt. J. C. Sanford,
Corps of Engineers, U. S. A.

LETTER OF THE CAMDEN (S. C.) BOARD OF TRADE.

Camden, S. C., *August 29, 1902.*

Dear Sir: In compliance with your request in connection with preliminary examination of Wateree River, Camden to its mouth, we would make the following statement in regard to the prospective commercial importance of stream and other matters relating to this subject.

Receipts of cotton at this town now 20,000 bales, and estimate of shipping 3,000 bales by river, very conservative; that much would be pledged and no doubt much increased. Besides, with a fair freight rate, 75 cents to $1, receipts of town could no doubt be increased to 30,000 or 40,000 bales, as present freight rate is $1.55 per bale to ports. When we had boats on river before, carrying cotton at 75 cents to $1 per bale, railroads met rates. Receipts exceeded 40,000 bales, boats carrying 7,000 to 10,000 bales. Estimate of annual shipment, 3,000 bales cotton; mill products equally conservative. Mills consume some 4,500 bales, and management would pledge boat amount shipment above stated.

Shipments of cattle, lumber, cross-ties, naval stores, oak staves, etc., will be very large. These interests are increasing, with exception of naval stores, and will be enormously developed by boat, as some of the finest pasture and grass lands in the world are along this river, and hay and cattle interests are not developed as should be on account of shipping facilities. Great tracts of hard wood will be open to market. We thus show that the business already here that can and will be pledged to line of steamers will pay a very handsome profit; besides these, other interests that will be enormously developed, producing a rapidly increasing volume of business. Then, apart from the direct and positive profit from operating steamers, the indirect saving to community, due to lowered railroad freights, on goods not shipped by river, would amount to some $25,000 annually. On one item alone (cotton), after deducting amount to be shipped by boat, some 14,000 bales remain to be shipped, at 50 cents saving per bale, equal $7,000. A very considerable feeder to boats will be the Camden Press Brick Company, making 7,000,000 to 8,000,000 brick per year. Plant is situated on navigable creek, emptying into river about 1 mile below brickyard, and can most conveniently ship by river. Last year this company shipped over 2,000,000 brick to Charleston by railroad, and if you can get shipping facilities can ship this entire output (7,000,000) there, as there will be a large demand for brick in that section another year. We, however, in our desire to make very conservative estimate, only claim about half this amount. Of course, if demand increases plant will be enlarged, and almost alone would occupy a boat's time.

Another matter would draw your attention. Mr. A. G. Clarkson operated a cottonseed-oil mill and fertilizer plant at a place called Wateree, about 25 miles below Camden. He obtained seed and disposed of his product by boat along river; river becoming unnavigable rendered his plant unprofitable; it burned, and he could not rebuild on account of impossibility of drawing seed and disposing product by boat. We mention these facts to call your attention to the amount of business to be developed along line of river. As our estimate is made up entirely of business at this point (Camden), we think at least one-third as much business would develop along river as that done here.

You will also please note that, in making up our estimate we do not include the total amount of commerce of Camden, but only the proportion in each line of business that we conservatively estimate will be shipped by river immediately, and if boat line is well managed this will be much increased. The citizens of Camden will agree to operate a line of steamers as soon as Government puts stream in proper condition to do so, and that there will then be immediately available for shipment annually **41,990 tons, valued at $1,150,000.**

Inasmuch as the United States Government has undertaken to improve the Great Pedee River from Cheraw down, and the Congaree River from Columbia down, thereby giving these places the relief so much needed in the way of water transportation, we feel that our request to improve the condition of the Wateree River is not unreasonable. We only desire that the same improvements be made on the Wateree River as on the above-mentioned rivers.

While of course the city of Columbia is more important than Camden from a commercial point of view, still we believe our river is deeper and easier, and cheaper of improvement than the Congaree. Cheraw is not of equal commercial importance with Camden, and the Great Pedee River will be no easier of improvement than the Wateree.

We therefore think it would be a hardship to be left with our river unimproved, and our city and country without the advantages of water transportation while it is furnished to the Congaree and Great Pedee country on either side of us.

LIST OF BOATS FORMERLY OPERATED ON RIVER, AND REMARKS.

Steamers *Camden* and *Tom Salmond*, built about 1837, carrying freight and passengers, were built to make outside passage to Charleston. Owners found in making them seaworthy that they were too large for profitable use on river, so sold, and bought somewhat smaller boats to operate through Santee Canal to Charleston. These boats (1839 to 1851) the *Kershaw*, *De Kalb*, and *Wateree*, we operated very profitably (in some years earning 40 to 50 per cent). About 1851 Santee Canal, by reason of neglect, became unnavigable, and these boats, having no Charleston connection, were sold.

About 1869 a new company was formed, and purchased a boat called the *Lillington*. This boat connected with Santee boats and did a good business, but was burned and sunk. Later the company operated the *John M. Cole*, but river was so neglected and became so obstructed by shoals and rafts as to render navigation slow and difficult, so it was abandoned.

From 1837 until boats were taken off river, we enjoyed a rate of freight on cotton to ports of 75 cents to $1 per bale, and our cotton receipts were from 30,000 to 40,000 bales per year. Railroad met rate. Boat carried about one-fourth and railroad about three-fourths of this cotton. Railroad (the South Carolina), which met this rate, made money, the Camden branch being, we understand, the best-paying piece of the road. To-day we have four systems of railroads—Southern, Atlantic Coast Line, Seaboard Air Line, and Northwestern. By a combination and pooling of interests cotton rates have advanced from 75 cents to $1.55 per bale, Camden to ports, and all other goods in like proportion. By reason of this discrimination cotton receipts have fallen from 40,000 to 20,000 bales. We are trying to upbuild the city by manufacturing interests, but are being fought by the railroads, who by combination are constantly increasing freight rates; for instance, taking the product of Columbia Mills to New York, through Camden, 40 miles farther, for 41 cents, and charging us 52 cents. Three years ago even our mill rate to New York was only 41 cents, same as Columbia.

In regard to river navigation, it is unnecessary to call your attention to the fact that since canal, recently cut, connecting Santee River with Winyah Bay, the trouble about river boats going outside to make port has been obviated, and Wateree boats would connect with seagoing steamers at Georgetown.

Hoping the above will meet with your favorable consideration, we are,

Yours, truly,

C. J. Shannon, Jr., *Chairman.*
A. D. Kennedy,
Henry Savage,
E. Miller Boykin,
Leo Schenk,
G. H. Baum,
M. M. Shannon,
Committee from Board of Trade on Commerce and Navigation.

Reid Whitford, Esq.,
U. S. Assistant Engineer.

APPENDIX O.

IMPROVEMENT OF RIVERS AND HARBORS IN EASTERN GEORGIA, OF INSIDE WATER ROUTE BETWEEN SAVANNAH, GEORGIA, AND FERNANDINA, FLORIDA, AND OF CUMBERLAND SOUND, GEORGIA AND FLORIDA.

REPORT OF LIEUT. COL. JAMES B. QUINN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Savannah Harbor, Georgia.
2. Savannah River, below Augusta, Georgia.
3. Savannah River, above Augusta, Georgia.
4. Harbor at Darien and Doboy bar, Georgia.
5. Altamaha River, Georgia.
6. Oconee River, Georgia.
7. Ocmulgee River, Georgia.
8. Brunswick Harbor, Georgia.
9. Inside water route between Savannah, Georgia, and Fernandina, Florida.
10. Cumberland Sound, Georgia and Florida.
11. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS AND SURVEY.

12. Club and Plantation creeks, Georgia.
13. Frederica River, Georgia.
14. Oconee River, Georgia.
15. Skiddaway Narrows, Georgia.

United States Engineer Office,
Savannah, Ga., July 16, 1904.

General: I have the honor to transmit herewith my annual report for the fiscal year ending June 30, 1904, upon the works of the river and harbor improvements in my charge.

Very respectfully,

James B. Quinn,
Lieut. Col., Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

O 1.

IMPROVEMENT OF SAVANNAH HARBOR, GEORGIA.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

For a detailed history of the work see report of the Chief of Engineers for 1903, pages 1146–1152.

Operations during the past fiscal year are given in the report of Mr. A. S. Cooper, assistant engineer, herewith, to which attention is invited.

At the close of the fiscal year the project was about 50 per cent completed.

COMMERCE AND NAVIGATION.

Full discussions of the commerce of Savannah were given in the Reports of the Chief of Engineers for 1890, pages 1252 and 1253, and for 1897, page 1497.

The regular lines of steamships established between this port and New York, Boston, Baltimore, and Philadelphia comprise a total of 17 steamers, of which 10 run to the first-named port, making an occasional trip to Boston, and 7 to the last-named two. During the calendar year 1903 they made 445 round trips and carried 863,232 tons of freight. They also handled in and out of Savannah 24,508 passengers.

On the inland waters there are a number of small steamers plying between Savannah and adjacent ports, besides numerous schooners and small sailboats. It is estimated that for the year 1903 this portion of the commerce amounted to 100,000 tons, valued at $1,500,000.

The chief articles of export are cotton, lumber, and naval stores, of which the shipments for the year 1903 were as follows: Of cotton, 1,319,119 bales; of lumber, 208,250,839 feet; and of naval stores, 188,393 barrels of turpentine and 752,270 barrels of rosin.

The total tonnage of the port, inward and outward bound, coastwise and local, during 1903 was 2,928,026 tons, valued at $173,275,346.

The shoaling at Tybee knoll causes the available depth to the sea to suffer a loss. The improvement so far completed has, however, progressed in a satisfactory manner. The project depth between the city and Tybee knoll has been practically obtained, and the indications are that the wide channel being dredged out will maintain itself by the natural scour, with slight assistance by dredging. It is believed that the new seagoing dredge now being built for this improvement will be able to dispose of the accretions in the portion of the channel between the ends of the jetties and the sea.

The available balances and additional appropriations recommended will be applied toward the completion of all dredging provided for under the present project.

Of the total amount expended during the fiscal year, $279,951.54 was for dredging under contract with P. Sanford Ross (Incorporated), at 17.5 cents per cubic yard, and $210,537.47 under contract with Atlantic, Gulf and Pacific Company, at 16.9 cents per cubic yard; $5,000 for dredging with U. S. dredge *Cumberland*, at 9.6 cents per cubic yard; $26,305.24 for constructing mooring dolphins under contract; $30,562.71 for repairs to training walls under contract, and $200,000 transferred to Maj. J. C. Sanford, Corps of Engineers, on account of construction of dredge for Savannah Harbor. These amounts include contingencies, with the exception of the item last mentioned.

Money statement.

July 1, 1903, balance unexpended		$954,874.68
Amount allotted August 25, 1903—emergency appropriation		5,000.00
Amount appropriated by sundry civil act approved April 28, 1904		105,000.00
		1,064,874.68
June 30, 1904, amount expended during fiscal year, for works of improvement		547,377.06
July 1, 1904, balance unexpended		[a] 317,497.62
July 1, 1904, outstanding liabilities		79,294.75
July 1, 1904, balance available		238,202.87
July 1, 1904, amount covered by uncompleted contracts		262,669.21
Amount (estimated) required for completion of existing project		175,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$175,000.00	
For maintenance of improvement	100,000.00	
		275,000.00
Submitted in compliace with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

AMOUNT AND DATE OF ALL APPROPRIATIONS.

From 1826 up to the date of the 22-foot plan of improvement appropriations amounting to $667,096.64 were made for the improvement of the harbor and for the removal of wrecks, as follows:

By act of Congress of—	
March 18, 1826	$50,000.00
March 3, 1829	24,490.00
July 3, 1832	25,000.00
March 2, 1833	43.06
March 2, 1833	8,430.62
June 28, 1834	30,000.00
March 3, 1835	20,000.00
July 7, 1838	15,000.00
August 30, 1852	$40,000.00
March 3, 1855	161,000.00
June 10, 1872	50,000.00
March 3, 1873	50,000.00
February 27, 1874	193,132.96
Total	667,096.64

Under the 22-foot plan of improvement the following appropriations were made:

By act of Congress of—	
June 23, 1874	$50,000.00
March 3, 1875	70,000.00
August 14, 1876	62,000.00
June 18, 1878	70,000.00
March 1, 1879	100,000.00
June 14, 1880	65,000.00
March 3, 1881	65,000.00
August 2, 1882	200,000.00
July 5, 1884	200,000.00
August 5, 1886	150,000.00
August 11, 1888	180,000.00
	1,212,000.00
Unexpended balance of last appropriation carried to new project	4,035.05
Total	1,207,964.95

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[a] $200,000 are disbursed by Major Sanford.

Under the 26-foot plan of improvement the following appropriations have been made:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$4,035.05
September 19, 1890	350,000.00
July 13, 1892	318,750.00
March 3, 1893	1,000,000.00
August 18, 1894	975,000.00
March 2, 1895	856,250.00
	3,504,035.05
Amount deposited by clerk of United States circuit court for the southern district of Georgia, March 20, 1895	500.00
	3,504,535.05
Unexpended balance of last appropriation carried to modified project	44,485.06
Total	3,460,049.99

Under the modified 26-foot project for improving Savannah Harbor the following appropriations have been made:

By act of Congress of—		
March 2, 1895 (unexpended balance)		$44,485.06
June 3, 1896		5,000.00
June 4, 1897		350,000.00
July 1, 1898		450,000.00
March 3, 1899	$200,000.00 50,000.00	
		250,000.00
June 13, 1902		50,000.00
		1,149,485.06
Amount deposited to credit of the appropriation		301.41
Total		1,149,786.47
Unexpended balance of last appropriations carried to new project		436,867.63
Total		712,918.84

Under the 28-foot plan of improvement the following appropriations have been made:

By act of Congress of—	
June 13, 1902 (unexpended balance from last appropriation)	$436,867.63
March 3, 1903	720,000.00
June 6, 1900 (allotted from emergency appropriation)	5,000.00
April 28, 1904	105,000.00
	1,266,867.63
Amount received from "Proceeds of Government property" November 12, 1902	75.00
Total	1,266,942.63
Grand total	7,314,973.05

CONTRACTS IN FORCE.

Name and address of contractor.	Amount and character of work.	Rate per cubic yard.	Date of approval.	Work begun.	Expires.
P. Sanford Ross (Incorporated), Jersey City, N. J.	Dredging 2,800,000 cubic yards.	$0.175	Dec. 15, 1902	Jan. 6, 1903	Aug. 16, 1904
Atlantic, Gulf and Pacific Co., New York, N. Y.	Dredging 3,310,000 cubic yards.	.169	Dec. 11, 1902	Feb. 15, 1903	Oct. 6, 1904
Simons-Mayrant Co., Charleston, S. C.	Repairs to training walls, 12,000 cubic yards of stone.	2.68	Jan. 25, 1904	Mar. 29, 1904	Sept. 29, 1904

Name and address of contractor.	Piling.						Pile driving, linear foot (53,000 linear feet).	Iron, per pound (129,000 pounds)	Timber.		Carbolineum, per gallon (600 gallons).
	60 feet (736).	55 feet (227).	50 feet (186).	45 feet (242).	40 feet (344).	35 feet (600).			Prime, per M feet (253,000 feet).	Merchantable, per M feet (226,000 feet).	
Egan, Smith & Co., Jacksonville, Fla.[a]	$4.44	$4.15	$3.89	$3.11	$2.89	$2.66	$0.10	$0.03¼	$30.36	$27.19	$1.34

Name and address of contractor.	Character of work.	Date of approval.	Work begun.	Expires.
Egan, Smith & Co., Jacksonville, Fla.[a]	Construction of mooring dolphins	Nov. 26, 1902	Dec. 10, 1902	May 10, 1903

[a] Extended; no specific date fixed. Completed June 30, 1904.

COMMERCIAL STATISTICS.

Cotton statistics of the port of Savannah, Ga., for the commercial year ending August 31, 1903, are as follows:

Receipts from all sources.

Grade.	Quantity.	Weight.	Value.
	Bales.	*Pounds.*	
Upland	1,223,994	618,288,329	$53,194,779
Sea-island	76,960	30,207,521	6,060,600
Total	1,300,954	648,495,850	59,255,379

Destination.	Upland.	Sea-island.
	Bales.	*Bales.*
Coastwise	270,992	42,721
Great Britain	168,957	26,984
France	44,264	6,300
Other continental ports	751,941	1,515
Mill consumption and burned	2,719	....
Reshipped to interior	1,274	1,452
Total	1,240,147	78,972

Total exports.

Grade.	Foreign exports.	Coastwise exports.	Total.
	Bales.	*Bales.*	*Bales.*
Upland	969,155	270,992	1,240,147
Sea-island	36,251	42,721	78,972
Total	1,005,406	313,713	1,319,119

Cotton receipts at Savannah, 1903.

Number of bales	1,300,954

Receipts of naval stores at the port of Savannah, season of 1903–4.

Spirits of turpentine	casks	193,647
Rosin	barrels	650,938

Arrivals and clearances of vessels and commerce at Savannah, Ga., from January 1 to December 31, 1903.

	Coastwise.			Foreign ports.						Total.			Greatest draft.	
				American vessels.			Foreign vessels.							
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	*Ft.*	*In.*
Arrived	551	1,050,916	21,324	8	4,680	71	137	198,599	2,998	696	1,254,195	24,393	24	6
Cleared	486	903,391	19,193	11	6,258	103	199	351,092	5,042	696	1,260,741	24,338	25	6

Commerce (foreign).

Value of exports	$58,566,773.00
Value of imports	1,066,773.00
Duties collected	75,221.02

REPORT OF MR. A. S. COOPER, ASSISTANT ENGINEER.

SAVANNAH, GA., *July 8, 1904.*

SIR: I have the honor to submit the following report of work done in Savannah Harbor during the fiscal year ending June 30, 1904:

DREDGING.

Under contract with the Atlantic, Gulf and Pacific Company, dated November 21, 1902, and supplemental agreement dated November 2, 1903, work was continued on the upper section of the harbor, completing the work from the old waterworks to Fort Oglethorpe about the middle of May, 1904. At different times three dredges were at work on this section. The details of the work are as follows:

Dredging done by Atlantic, Gulf and Pacific Company, July 1, 1903, to June 30, 1904, waterworks to Fort Oglethorpe.

Date.	Dredge No. 4.	Dredge No. 1.	Dredge No. 7.	Total.
1903.	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*
July	125,680.0	75,292.6		200,972.6
August	88,960.0	72,933.7		161,893.7
September	61,827.0	49,084.4		110,911.4
October	96,520.0	52,958.5		149,478.5
November	32,429.8	47,024.3	28,262.5	107,716.6
December		53,262.7	27,079.3	80,342.0
1904.				
January		14,339.2	21,263.4	35,602.6
February	73,897.0	27,212.1	19,908.9	121,018.0
March	44,991.5	43,612.6	25,210.1	113,814.1
April	68,569.0	31,414.1		99,983.1
May	32,025.8			32,025.8
June				
Total	624,900.1	467,134.2	121,724.1	1,213,758.4

Logs removed, 145.

Dredge *No. 4* is a hydraulic dredge and worked night and day; dredge *No. 1* is a clam-shell dredge, and worked night and day during July and August, 1903, and day only for the balance of the time; dredge *No. 7* is a clam-shell dredge and worked days only.

From this table it will be seen that the total amount removed under this contract during the fiscal year was 1,213,758.4 cubic yards. The total amount done under this contract to June 30, 1904, is 1,696,293.8 cubic yards. As the original estimate for the localities dredged was 2,210,000 cubic yards, there was a saving of 513,706.2 cubic yards. This difference is largely due to the fact that a slope of 1 to 7 was allowed for on the sides of the cut, and the slope actually made was about 1 to 4; also to the fact that the dredging was not done to a depth quite as deep as estimated. No work has as yet been done in the Quarantine channel on this contract, where there is about 950,000 cubic yards to be removed.

Under contract with P. Sanford Ross (Incorporated), work was continued on the section from Fort Oglethorpe to Fort Pulaski; also at the oyster lump on Tybee knoll. This contract was made November 14, 1902, and two supplemental agreements were drawn on October 26, 1903, and May 20, 1904. The work in detail is shown by the following tables:

Locality.	Amount done during fiscal year.	Total amount done under contract.	Original estimate.
	Cubic yards.	*Cubic yards.*	*Cubic yards.*
Obstructions	211,323.3	272,872.2	400,000.0
Upper flats	252,406.2	399,406.2	1,000,000.0
Pocket flats	35,018.8	35,018.8	
Lower flats	338,085.1	353,969.7	
Long Island crossing	591,223.8	931,868.8	1,100,000.0
Tybee knoll	16,661.6	16,661.6	300,000.0
Total	1,444,718.8	2,010,797.3	2,800,000.0

Logs removed, 37.

Dredging done by P. Sanford Ross during fiscal year ending June 30, 1904, Fort Oglethorpe to Tybee knoll.

Date.	Dredge No. 1.	Dredge John Babcock.	Dredge No. 7.	Dredge No. 14.	Dredge No. 4.	Dredge No. 4 (Atlantic, Gulf and Pacific Co.).	Total.
1903.	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*
July	24,271.1	11,710.0		56,597.4	39,013.6		131,592.1
August	20,580.0	28,840.0		40,334.5	36,888.6		126,643.1
September	16,845.8	21,317.0		40,083.5	29,351.3		107,597.6
October	26,588.8	19,705.0		39,431.2	35,195.5		120,920.5
November	14,673.3	28,635.0		20,475.6	31,366.5		95,150.4
December	16,023.6	26,664.0		35,994.7	32,729.3	29,564.0	140,975.6
1904.							
January	15,353.2	14,736.0		35,412.5	19,806.1	50,044.5	135,352.3
February	15,457.2	6,603.0		36,415.7	10,979.3	14,830.0	84,285.2
March	19,826.8	18,312.5	9,814.8	31,761.6	30,484.2		110,199.9
April	17,049.7	28,161.0	36,825.4	36,956.4	29,178.4		148,170.9
May	18,664.5		29,628.6	19,312.7	24,205.6	22,516.0	114,327.4
June	5,989.3		17,394.2		31,302.5	74,717.8	129,503.8
Total	211,323.3	204,683.5	93,663.0	392,775.8	350,500.9	191,672.3	1,444,618.8

Dredge *No. 1* is a scoop dredge; dredges *Nos. 7, 14,* and *4* are clam-shell dredges; dredges *No. 4* (Atlantic, Gulf and Pacific Company) and *John Babcock* are hydraulic dredges. All but the hydraulic dredges worked days only.

Of the above work the obstructions and flats only are completed. At the obstructions 211,323.3 cubic yards were dredged during the year, making a total of 273,872.2 cubic yards during the contract, being 126,127.8 cubic yards less than the original amount estimated for.

At the flats there was removed during the past fiscal year 625,510.1 cubic yards, making a total of 788,394.7 cubic yards for the entire contract, being 211,605.3 cubic yards less than the original estimate. These estimates have proven too large, mainly on account of the slopes in obstructions channel being less than those used in estimating, and also because the cuts were not made quite as deep as estimated for.

At Long Island crossing 591,223.8 cubic yards were dredged during the fiscal year, making a total for the contract of 931,868.8 cubic yards. This work is not yet completed, there being about 350,000 cubic yards to be dredged. The estimate here will therefore fall short about 200,000 cubic yards. This was caused partly by a change in the ranges and partly by shoaling after the dredging was finished.

At the Oyster lump on Tybee knoll very little work was done, there being only 16,661.6 cubic yards removed during the fiscal year. It is not likely that more than 250,000 cubic yards will be necessary to be removed at this place.

Most of the work done under these two contracts show very little shoaling. At the upper end of the work, from old waterworks down, about 700 feet, the cut has filled up from 24 feet at mean low water to about 18 feet at mean low water. At Long Island crossing there has been about 300,000 cubic yards filled into the cut, mainly in the lower one-half. The work of redredging this has already begun. There has been no filling anywhere else worth mentioning.

In examining the inspection and estimate surveys made this year and comparing them with the survey of 1900, I notice that in nearly all places the banks adjacent to the cuts have scoured off considerably; in some instances as much as 3 feet. The quantity of material moved from these banks it is believed is much larger than the amount deposited in the cuts recently made. In order to accurately determine what is taking place in this respect, I would recommend that a complete survey be made of the harbor as soon as all of the dredging is completed. Such a survey would cost not over $2,000.

On September 1, 1903, the dredge *Cumberland* began work on Tybee knoll, under a special allotment of $5,000, made August 25, 1903; the boat was ordered to Fernandina, however, on September 8, 1903. During these eight days she removed 9,701 cubic yards. The dredge returned on November 28, 1903, and remained on Tybee knoll until January 9, 1904. On account of broken pumps and rudder post there was only thirteen days work done during this time, and 32,596 cubic yards were removed; making a total of 42,297 cubic yards removed from Tybee knoll during the fiscal year.

MOORING DOLPHINS.

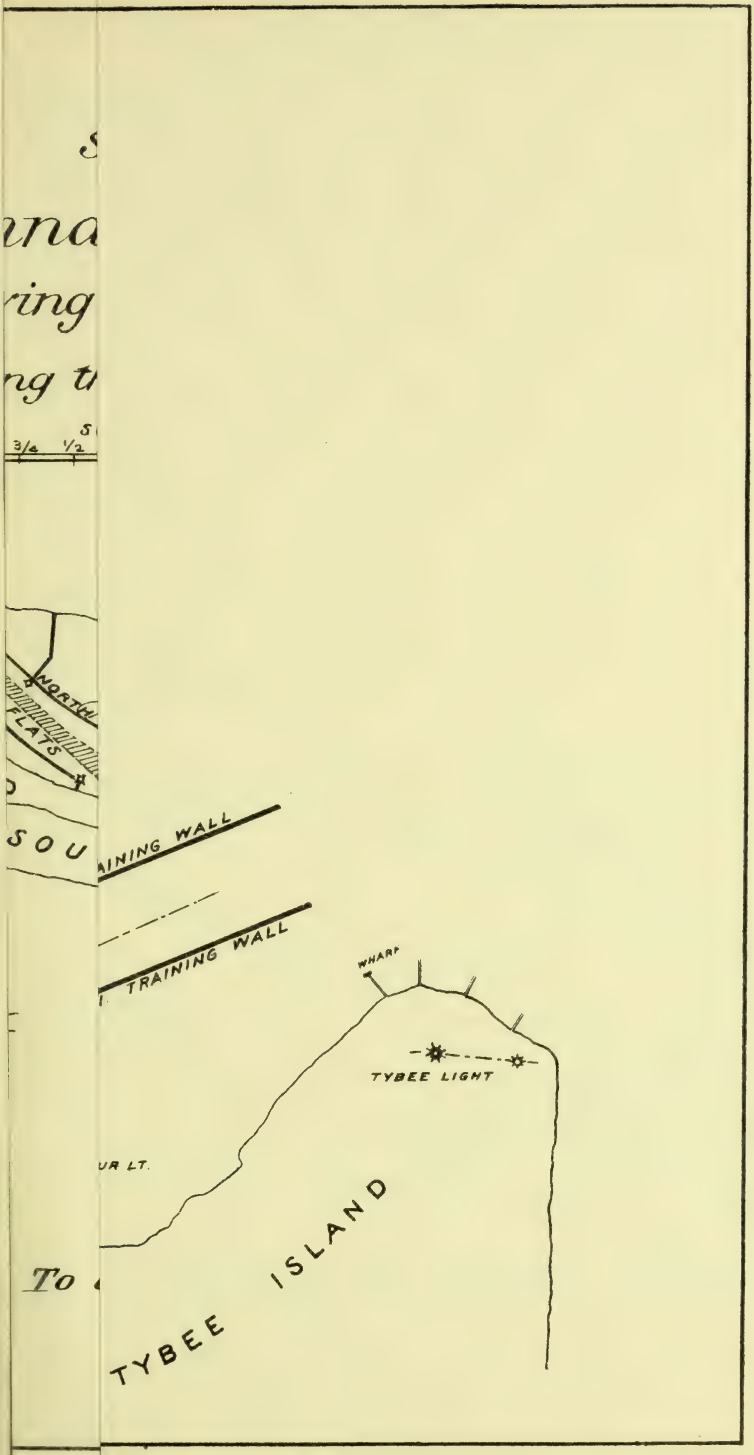
Work was continued on the mooring dolphins, under contract with Egan, Smith & Co., dated November 3, 1902, and work was completed on June 30, 1904. The total amount of work done during the fiscal year is as follows:

Piles driven:		
60-foot		521
55-foot		125
50-foot		196
45-foot		221
40-foot		335
35-foot		155
Pile driving, linear feet penetration		30,677
Lumber:		
Prime, inspection	feet B. M.	220,496
Merchantable, inspection	do	120,492
Iron	pounds	112,018.08
Carbolineum	gallons	676

The total amount of material placed in the two dolphins is as follows:

Piles driven:		
60-foot		622
55-foot		180
50-foot		254
45-foot		276
40-foot		429
35-foot		388
Pile driving, linear feet penetration		42,574.2
Lumber:		
Prime, inspection	feet B. M.	286,700
Merchantable, inspection	do	168,696
Iron	pounds	141,281.88
Carbolineum	gallons	832

The upper dolphin (at the bight) is 1,300 feet long, and the lower one (at Venus Point) 1,800 feet long.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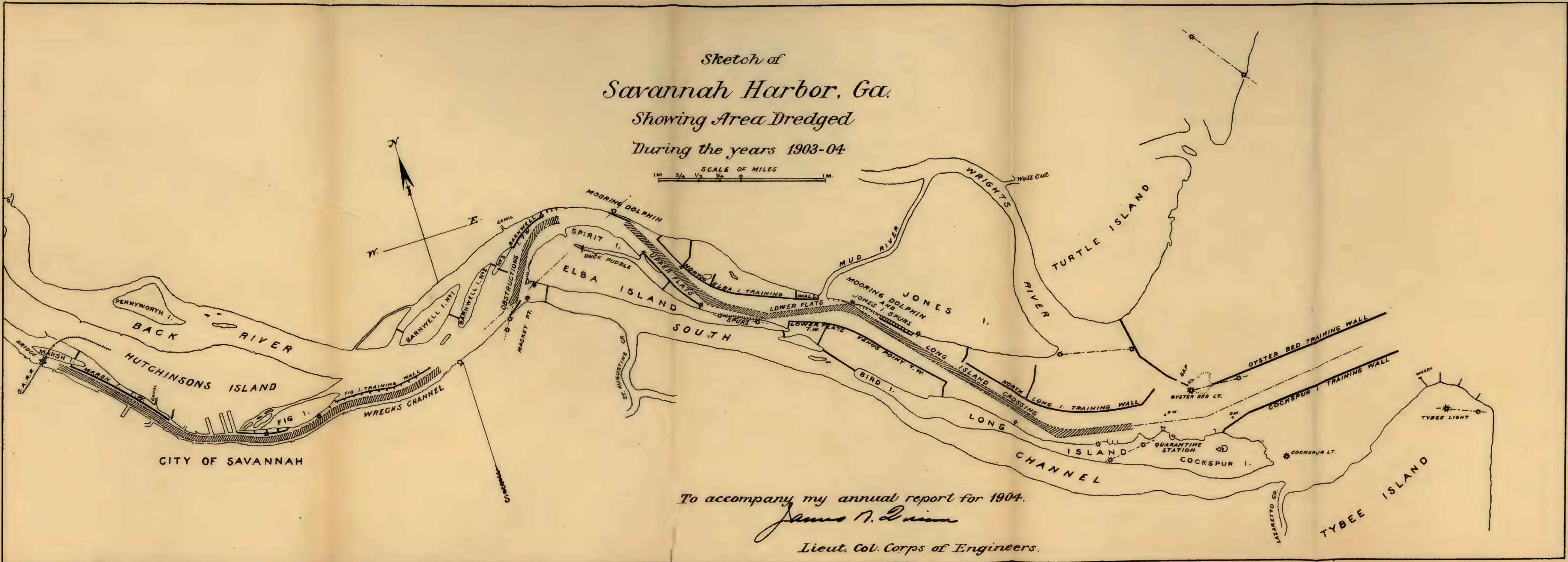

Sketch of
Savannah Harbor, Ga.
Showing Area Dredged
During the years 1903-04

To accompany my annual report for 1904.

James B. Quinn

Lieut. Col. Corps of Engineers.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

JETTY WORK.

On January 2, 1904, a contract for repairs to the jetties was entered into with Simons-Mayrant Company. The amount of rock placed under this contract is as follows:

	Cubic yards.
Venus Point training wall	862.49
North Long Island training wall	4,418.94
Cockspur Island training wall	5,117.46
Total	10,398.89

There will be about 12,000 cubic yards of rock used in all under this contract, and the work will be completed about July 15, 1904. These jetties have been raised to about 1.5 feet above mean low water, the return face at the shore being at about 3 feet above mean low water.

SELF-REGISTERING TIDE GAUGES.

During the past year and a small part of the previous year, self-registering gauges have been read at the following places: Fort Pulaski, Fort Oglethorpe, old waterworks, cross tides (upper), cross tides (lower).

The records from these gauges are nearly all worked up to date. Without going into details at this time, these records show the following results:

At Fort Pulaski the low-water plane has been raised 0.1 foot, and the high-water plane raised 0.18 foot, making an increase in range of 0.08 foot.

At Fort Oglethorpe the records are badly broken and not all worked up as yet. Taking one year's records, up to last December, there appears to be a raise in both planes of the same amount, viz, 0.28 foot, leaving the range the same as before. At that time, however, the dredging had not yet been completed at obstructions and repairs to South Channel dams had been finished, so there might have been a rise in the low-water plane at that time, due to South Channel dams. In looking over later records, not yet worked up, it is quite evident that the low-water plane at this point has been lowered again by the dredging done at obstructions to a plane a little below its former elevation.

At waterworks the records, taken before dredging began last year, show only a slight lowering of the low-water plane from the 1894–95 plane. During the time that dredging was in progress the records show a lowering of this plane of about 0.50 foot, and since the dredging was completed the records show that the low-water plane at this point has been lowered 0.98 foot, and also that the high-water plane has been raised 0.13 foot, making an increase in range of 1.11 foot at this point.

At cross tides upper gauge the same thing has taken place, and in nearly the same amount of change. Here the records, taken after dredging was completed, show that the low-water plane has been lowered 1.12 feet, and the high-water plane raised 0.05 foot, making an increase in range of 1.17 feet.

The cross tides lower gauge has been read only two months and the records are not as complete as they should be, but from what has been taken the plane of low water on that side of the dam appears to have been lowered about 0.05 foot.

In view of the fact that there are large claims against the Government for alleged damages to rice lands caused by the harbor improvements, based on information so radically different from the facts shown above, I desire to call your attention to the importance of keeping up these gauges, and working up the information shown by them; so that when these cases come into court again this office will be in a position to present facts based upon indisputable evidence.

Very respectfully, your obedient servant,

A. S. Cooper,
Assistant Engineer.

Lieut. Col. James B. Quinn,
Corps of Engineers.

O 2.

IMPROVEMENT OF SAVANNAH RIVER, GEORGIA, BELOW AUGUSTA.

At the close of the fiscal year the project depth can be carried from Savannah to Augusta, except at two or three places where the controlling depth at an ordinary stage of summer low water is 3 feet.

As the total amount estimated in the project for the improvement of this stream has been appropriated, and as further training dikes and shore protections are absolutely necessary, a new project of improvement will be required to carry on the work.

It is estimated that for the completion of the project, as approved in 1890, there will be required the further sum of $75,000 in addition to the amount required for maintenance.

It is further recommended that a survey of the river be made with a view to providing a permanent system of improvement by locks and dams for the upper portion of the river, just below Augusta. It is estimated that this survey will cost $5,000.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Work was continued on training dikes and shore protection near Augusta, under the contract of January 7, 1903, with A. J. Twiggs, until September 7, 1903, when the contract was completed. In this work, which consisted chiefly of the refilling and repairing of previously constructed dikes, there were placed 9,137.6 cubic yards of brush bundles, 3,714.9 cubic yards of stone, 11,360 feet B. M. of timber, 568 pounds of iron spikes, and 600 linear feet of piling. The localities on the river where this work was carried on were Gardners bar, Kirks bar, Sand Bar Ferry, Blue House bar, and Buggs bar.

The snag boat *Tugaloo* was engaged in snagging operations for about four and one-half months during the fiscal year. During this time she removed 1,445 snags and 129 stumps from the channel, cut 1,126 overhanging trees and 93 logs, and girdled 335 trees on the banks of the stream.

The capstan engines of the snag boat *Tugaloo* were repaired and the deck of the boat recalked.

The amount expended during the fiscal year in connection with dike work was $15,897.99, and in connection with snagging operations $8,994.05. These amounts include contingencies.

At the close of the fiscal year the approved project was about 75 per cent completed.

COMMERCE AND NAVIGATION.

A detailed statement of the sources of the commerce of this river is given on page 1331 of the Annual Report of the Chief of Engineers for 1890, and on page 1504 of the report for 1897.

During the calendar year 1903 there were 5 steamers engaged in river traffic, making 200 round trips between Savannah and Augusta, and carrying 60,487 tons of freight, valued at $6,399,137.

There were also received at Savannah from this river, in small boats and lighters, 74,795 bushels of rice, valued at $74,795. The increase in tonnage over the year previous was 4,957 tons.

During the same year about 25,000,000 feet B. M. of timber was rafted down the river, valued at about $325,000.

Money statement.

July 1, 1903, balance unexpended	$31,508.49
June 30, 1904, amount expended during fiscal year, for works of improvement	24,892.04
July 1, 1904, balance unexpended	6,616.45
July 1, 1904, outstanding liabilities	1,341.34
July 1, 1904, balance available	5,275.11
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project for improvement of the Savannah River, adopted in 1880, the following appropriations were made:

By act of Congress of—	
March 3, 1881	$15,000.00
August 2, 1882	25,000.00
July 5, 1884	15,000.00
August 5, 1886	15,000.00
August 11, 1888	21,000.00
	91,000.00
Unexpended balance from last appropriation, carried to new project	19.91
Total	90,980.09
Received from other appropriations for use of snag boat	2,500.00
Aggregate	93,480.09

Since the existing project for improving the Savannah River was adopted the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (balance unexpended)	$19.91
September 19, 1890	25,000.00
July 13, 1892	35,000.00
August 18, 1894	15,000.00
June 3, 1896	15,000.00
March 3, 1899	20,000.00
June 6, 1900	64,000.00
March 3, 1901	100,000.00
June 28, 1902	86,000.00
Total	360,019.91
Amount received from "Proceeds of Government property," November 12, 1902	50.00
	360,069.91
Grand total	453,550.00

CONTRACT IN FORCE.

Name and address of contractor: A. J. Twiggs, Augusta, Ga.
Character of work: Dike work.
Date of approval: January 22, 1903.
Work begun: January 26, 1903.

Completed: September 7, 1903.

Quantities: 110,000 linear feet piling, at 4½ cents per linear foot; 57,000 linear feet pile driving, at 8 cents per linear foot; 32,000 feet waling and cross-ties, at $24 per M feet; 3,000 pounds wire spikes, at 5 cents per pound; 2,500 pounds iron wire, at 5 cents per pound; 39,000 cubic yards brush bundles, at 48 cents per cubic yard; 4,300 cubic yards mattress weaving, at 75 cents per cubic yard; 9,500 cubic yards stone, at $2.10 per cubic yard.

O 3.

IMPROVEMENT OF SAVANNAH RIVER ABOVE AUGUSTA, GEORGIA.

The Savannah River above Augusta is navigable only by pole boats from the locks 7 miles above the city of Augusta to Petersburg, a distance of 48 miles.

So far as is known no deterioration of the channel has taken place during the past year, though it is probably very much obstructed by snags, no work having been done for the past five years. The channel is a difficult one, and $6,000 can be profitably expended in its improvement during the fiscal year ending June 30, 1906.

No work was done during the past fiscal year.

The project is about 50 per cent completed.

It is proposed to apply available balances and additional appropriation recommended toward the removal of obstructions and the widening and straightening of the channel.

COMMERCE AND NAVIGATION.

A detailed statement of the commerce tributary to this river is given in a report on the examination and survey of the river, printed as House Executive Document No. 213, Fifty-first Congress, first session.

The freight carried on the river consists of cotton, grain, fertilizers, and general merchandise. In 1903 it amounted to about 2,514 tons, valued at $212,887.51.

Money statement.

July 1, 1903, balance unexpended	$64.45
July 1, 1904, balance unexpended	64.45
Amount (estimated) required for completion of existing project	13,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	6,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of improvement of Savannah River above Augusta, adopted in 1879, the following appropriations were made:

By act of Congress of—	
June 14, 1880	$16,000
March 3, 1881	8,000
August 2, 1882	15,000
Total	39,000

Since the existing project for improving this portion of Savannah River was adopted the following appropriations have been made for this work:

By act of Congress of—	
July 13, 1892	$10,000
August 18, 1894	6,000
June 3, 1896	3,000
March 3, 1899	1,000
Total	20,000

O 4.

IMPROVEMENT OF HARBOR AT DARIEN AND DOBOY BAR, GEORGIA.

Darien Harbor is constituted by that portion of Darien River between the town of Darien and Doboy Sound. Doboy bar constitutes the nearest ocean entrance to Darien Harbor and the Altamaha River. These two works were consolidated by the act of Congress approved June 13, 1902.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Dredging work was begun in Darien Harbor on August 8, 1903, under the contract of March 28, 1903, with George T. Warner, and completed November 26, 1903, a total of 83,357 cubic yards of material being removed. One hundred and forty-three logs, encountered in dredging, were also removed. The cost of this work was 16¾ cents per cubic yard for dredging and $5 for each log removed.

The work of repairing the spur dams in Darien Harbor, by use of hired labor and Government plant, was begun, and 4,000 cubic yards of brush bundles were made. On January 5, 1904, work was suspended and the plant removed to Cumberland Sound, Georgia and Florida, for emergency work on Cumberland Island. The repairs to the spur dams will be resumed in August, 1904.

No steps were taken toward the improvement of the channel across Doboy bar.

The proportion of the approved project for Darien Harbor accomplished up to June 30, 1904, is about 80 per cent and for Doboy bar nothing, it being necessary to abandon the portion of channel previously dredged.

Allotments.—Of the $30,000 appropriated by act of June 13, 1902, for Darien Harbor and Doboy bar, the sum of $6,000 for repairs to spur dams and $18,000 for dredging, in addition to an unexpended balance of $10.46, were allotted November 7, 1902, for Darien Harbor. This work was also reimbursed by the appropriation for "Improving Cumberland Sound, Georgia and Florida," by $1,500 for material transferred.

An allotment of $2,000 was made December 23, 1903, for the purpose of making a complete survey of Doboy bar to determine the best route for a channel across the bar.

The amount expended during the fiscal year for dredging was $16,134.03, and for repairs to spur dams $3,359.16. These amounts include contingencies.

It is proposed to apply available balances and additional appropriation recommended in obtaining the projected channel through the shoals in Darien Harbor by dredging and repairs to spur dams and in dredging the required channel through Doboy bar, after making a complete survey of the locality.

COMMERCE AND NAVIGATION.

The commerce of Darien consists almost entirely of timber. A small product of rice and naval stores is shipped from that point. A daily steamer runs to Brunswick. The bulk of the timber passing through Darien Harbor from the Altamaha River will probably cross Doboy bar when the improvement is complete. When the timber is gone, which is a matter of comparatively a few years, the commerce will probably greatly decrease.

In 1903 the commerce of Darien Harbor amounted to 176,131 tons, valued at $1,154,597, an increase over the year previous of 1,603 tons.

Money statements.

DARIEN HARBOR.

July 1, 1903, balance unexpended	$23,953.13
Amount received from appropriation for Cumberland Sound, Georgia and Florida	1,500.00
	25,453.13
June 30, 1904, amount expended during fiscal year, for works of improvement	19,493.19
July 1, 1904, balance unexpended	5,959.94
July 1, 1904, outstanding liabilities	1,468.59
July 1, 1904, balance available	3,491.35
Amount (estimated) required for completion of existing project	39,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	39,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

DOBOY BAR.

Amount allotted from appropriation for improving harbor at Darien and Doboy bar, Georgia	$2,000.00
July 1, 1904, balance unexpended	2,000.00
Amount (estimated) required for completion of existing project	(a)

CONSOLIDATED.

July 1, 1903, balance unexpended	$80,819.09
Amount received from appropriation for Cumberland Sound, Georgia and Florida	1,500.00
	82,319.09
June 30, 1904, amount expended during fiscal year, for works of improvement	19,493.19
July 1, 1904, balance unexpended	62,825.90
July 1, 1904, outstanding liabilities	1,468.59
July 1, 1904, balance available	61,357.31
Amount (estimated) required for completion of existing project	39,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	39,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

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[a] See Darien Harbor.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Previous to the existing project there was appropriated for Darien Harbor:

By act of Congress, June 18, 1878	$8,000

Since the existing project for improving this work was adopted the following appropriations have been made:

September 19, 1890	$25,000
July 13, 1892	25,000
August 18, 1894	25,000
June 3, 1896	20,000
March 3, 1899	10,000
From the appropriation of $30,000, Darien Harbor and Doboy bar, June 13, 1902, there has been allotted, November 7, 1902	24,000
Total	129,000
Amount received from appropriation for Cumberland Sound, Georgia and Florida	1,500
	130,500
Grand total	138,500

Previous to the existing project there was appropriated for Doboy bar:

By act of Congress, August 5, 1886	$5,795.40

Since the existing project for this work was adopted there was the following appropriation made:

March 3, 1899	$70,000.00
Unexpended balance carried to consolidated appropriation for improving harbor at Darien and Doboy bar	50,865.96
Total	19,134.04
Amount allotted December 23, 1903	2,000.00
Total	21,134.04
Grand total	26,929.44
Aggregate of appropriations for Darien Harbor and Doboy bar	220,295.40

CONTRACT IN FORCE.

Contractor: George T. Warner, Savannah, Ga.
Character of work: Dredging 124,000 cubic yards.
Rate: 16¾ cents per cubic yard.
Date of approval: April 16, 1903.
Work begun: August 8, 1903.
Expires: May 16, 1904.
Completed: November 26, 1903.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels at Darien, Ga., from January 1 to December 31, 1903.

	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Arrived	53	53,029	787	....	....	....	17	21,675	323	70	74,704	1,110
Cleared	28	10,910	203	....	....	....	45	65,600	958	73	76,510	1,161

Timber shipments from port of Darien, Ga.

Year.	Foreign.		Coastwise.		Total.	
	Superficial feet.	Value.	Superficial feet.	Value.	Superficial feet.	Value.
Jan. 1 to Dec. 31, 1903	65,602,309	$911,572	9,638,131	$173,486	75,240,440	$1,085,078

Commerce.

Value of exports and imports	$1,154,597.00
Total collections	1,490.42

O 5.

IMPROVEMENT OF ALTAMAHA RIVER, GEORGIA.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Surveys were made of three small shoals. The amount expended during the fiscal year includes cost of caring for plant, tied up at Doctortown.

The proportion of the approved project accomplished up to June 30, 1904, is about 45 per cent.

It is proposed to apply available balances and additional appropriation recommended to the removal of snags, stumps, etc., the cutting of overhanging trees, and the removal of sand bars and rock shoals.

The amount expended during the fiscal year was, for surveys, $488.65, and for care of plant, $831.40. These sums include contingencies.

Many of the old works of improvement require repairs, several rock shoals need to be removed, additional training dikes are required, and numerous snags and overhanging trees should be removed. Thirty thousand dollars can profitably be expended during the fiscal year ending June 30, 1906.

COMMERCE AND NAVIGATION.

The principal items of commerce of the river are timber and naval stores and the merchandise necessary to supply the camps of the producers of those articles.

During the calendar year 1903, 137,471,036 feet B. M. of timber were rafted down the river, valued at about $1,511,988. The majority of this timber came from the Oconee and Ocmulgee rivers and was rafted down the Altamaha to mills at Darien and vicinity. Fifty-seven million one hundred and forty thousand three hundred and ninety-six feet, valued at about $571,403, originated on the Altamaha.

There were also handled about 12,630 tons of freight, valued at about $690,000.

Money statement.

July 1, 1903, balance unexpended		$4,151.92
June 30, 1904, amount expended during fiscal year, for works of improvement		1,320.05
July 1, 1904, balance unexpended		2,831.87
July 1, 1904, outstanding liabilities		200.00
July 1, 1904, balance available		2,631.87
Amount (estimated) required for completion of existing project		110,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$30,000.00	
For maintenance of improvement	10,000.00	
		40,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project of improvement of the Altamaha River, adopted in 1880, the following appropriations were made:

By act of Congress of—	
March 3, 1881	$5,000.00
August 2, 1882	15,000.00
July 5, 1884	20,000.00
August 5, 1886	20,000.00
August 11, 1888	10,000.00
	70,000.00
Unexpended balance of last appropriation carried to new project	223.41
Total	69,776.59

Since the existing project for improving Altamaha River was adopted in 1890 the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$223.41
September 19, 1890	15,000.00
July 13, 1892	15,000.00
August 18, 1894	10,000.00
June 3, 1896	10,000.00
March 3, 1899	6,000.00
June 6, 1900 (allotted from emergency appropriation)	9,000.00
June 13, 1902	10,000.00
Total	75,223.41
Grand total	145,000.00

O 6.

IMPROVEMENT OF OCONEE RIVER, GEORGIA.

This river is tributary to the Altamaha River.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

There were removed from the channel 2,791 snags and 252 stumps, and 69 logs, and 3,370 overhanging trees were cut on the banks of the stream.

A training dike 350 feet long was constructed at Bonny Clabber for the removal of a sand bar at that place.

Surveys were made of several sand bars, with a view to their future removal.

The work done during the fiscal year has resulted in clearing the channel of snags and logs for about 40 miles between the Forks and Dublin, and in partially removing the shoal at Bonny Clabber sand bar.

Of the total amount expended during the fiscal year, $9,903.34 was for snagging; $3,215.18 for construction of training dike and $584.82 for surveys. These amounts include contingencies.

The proportion of the approved project accomplished up to June 30, 1904, is about 40 per cent.

It is proposed to apply available balances and additional appropriation recommended to the removal of snags and other obstructions from the river between the Forks and a point 25 miles above Dublin, and, if possible, to extend the work to Milledgeville. Also to remove rock ledges just above Dublin.

Rock ledges above Dublin and long sand shoals below Milledgeville require removal and the channel needs improvement at several places between Dublin and the Forks. It is estimated that $30,000 can be profitably expended for works of improvement during the fiscal year ending June 30, 1906.

COMMERCE AND NAVIGATION.

The Oconee River is navigable from the mouth to Milledgeville. During the year 1903 the steamers plying the river in the vicinity of Dublin handled 31,174 tons of freight, valued at $1,241,802. In addition to this there were rafted down the river during the same year 75,092,206 feet B. M. of timber, valued at about $844,092. Excepting the timber traffic, the commerce of the river is carried on in detached segments tributary to the railroads crossing the river.

Money statement.

July 1, 1903, balance expended		$17,963.83
Amount received from proceeds of Government property		43.00
		18,006.83
June 30, 1904, amount expended during fiscal year, for works of improvement		13,703.34
July 1, 1904, balance unexpended		4,303.49
July 1, 1904, outstanding liabilities		367.86
July 1, 1904, balance available		3,935.63
Amount (estimated) required for completion of existing project		122,857.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$30,000.00	
For maintenance of improvement	10,000.00	
		40,000.00
Submitted in compliance with requirements of sundry civil act of June 4,1897, and of section 7 of the river and harbor act of 1899.		

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Since the works of improvement were begun the following appropriations have been made:

By act of Congress of—	
June 18, 1878	$10,000.00
March 3, 1879	1,500.00
June 14, 1880	1,500.00
March 3, 1881	2,500.00
August 2, 1882	5,000.00
July 5, 1884	3,000.00
August 5, 1886	9,000.00
August 11, 1888	12,500.00
Total	45,000.00
Unexpended balance from last appropriation carried to new project	177.82
Total	44,822.18

Since the existing project for improving the Oconee River was adopted the following appropriations have been made for this work:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$177.82
September 19, 1890	25,000.00
July 13, 1892	25,000.00
August 18, 1894	10,000.00
June 3, 1896	10,000.00
March 3, 1899	10,000.00
June 6, 1900 (allotted from emergency appropriation)	3,750.00
June 13, 1902	25,000.00
Total	108,927.82
Amount received from proceeds of Government property	43.00
Grand total	153,793.00

O 7.

IMPROVEMENT OF OCMULGEE RIVER, GEORGIA.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Twenty-seven snags and 3 stumps were removed from the river channel, and 72 overhanging trees and 2 logs were cut on the banks of the stream.

Three spur dams, with a combined length of 400 feet, were constructed at Macon bar, and the training dike at Buzzards bar was repaired. In this work 170 piles were driven, and 4,000 cubic yards of bundled brush and 370 cubic yards of stone were placed.

There were removed from Colliers Bluff shoal 595 cubic yards of rock, and from Tanyard shoal 2,090 cubic yards of rock.

All of the above work was done by hired labor and use of Government plant.

Surveys were made of 13 shoals in the river with a view to providing data for use in their future improvement.

Of the total amount expended during the fiscal year $2,777 was for dike work, $5,965.96 for rock removal, $250 for snagging, and $223 for surveys. These amounts include contingencies. This expenditure has resulted in greatly improving the bad conditions previously existing in the river just above Hawkinsville and just below Macon.

It is proposed to apply available balances and additional appropriation recommended toward the removal of snags, rock, and sand shoals, revetting caving banks, and the cutting of overhanging trees, principally between Hawkinsville and Macon.

The proportion of the approved project accomplished up to June 30, 1904, is about 80 per cent.

The difficulty in maintaining the depth at the upper end of the river at Macon is in preventing erosion of the banks, and to overcome this much more revetting of the banks will have to be done than was estimated for in the existing project.

Owing to freshets, unforseen changes in the channel, and damages to the dikes and dams and regulating constructions, it will be necessary to provide further funds to complete the improvement as originally planned, which improvement should be continued until the benefits desired are realized. To accomplish this the sum of $75,000 should be appropriated for prosecution of the work, and the further sum of $5,000 annually for maintenance.

COMMERCE AND NAVIGATION.

A detailed discussion of this subject will be found on pages 1478 to 1484 of the Report of the Chief of Engineers for 1890, and page 1520 of the same report for 1897.

At present there is no navigation at all between Macon and Hawkinsville, except that one small steamer occasionally goes to Macon.

During the calendar year 1903 the steamers plying the river handled 12,744 tons of freight, valued at about $408,370. There were also rafted down the river 35,807,822 feet B. M. of timber, valued at about $382,947.

Money statement.

July 1, 1903, balance unexpended	$13,137.96
Amount received from proceeds of Government property	43.00
Amount reclaimed by Captain Gillette	20.00
	13,200.96
June 30, 1904, amount expended during fiscal year, for works of improvement	9,215.96
July 1, 1904, balance unexpended	3,985.00
July 1, 1904, outstanding liabilities	233.42
July 1, 1904, balance available	3,751.58
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	30,000.00

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Upon the original project of improvement of the Ocmulgee River, adopted in 1876, the following appropriations were made:

By act of Congress of—	
August 14, 1876	$15,000.00
June 18, 1878	15,000.00
March 3, 1879	7,000.00
June 14, 1880	7,000.00
March 3, 1881	5,000.00
August 2, 1882	5,000.00
July 5, 1884	3,000.00
August 5, 1886	7,500.00
August 11, 1888	15,000.00
Total	79,500.00
Unexpended balance carried forward from last appropriation to new project	109.27
Total	79,390.73

Since the existing project for improving Ocmulgee River was adopted the following appropriations have been made for the work:

By act of Congress of—	
August 11, 1888 (unexpended balance)	$109.27
September 19, 1890	30,000.00
July 13, 1892	25,000.00
August 18, 1894	10,000.00
June 3, 1896	10,000.00
March 3, 1899	20,000.00
June 6, 1900	40,000.00
March 3, 1901	40,000.00
June 28, 1902	56,000.00
Total	231,109.27
Total, all appropriations	310,500.00
Amount received from proceeds of Government property November 12, 1902	106.00
Amount received from proceeds of Government property October 28, 1903	43.00
Amount reclaimed by Captain Gillette	20.00
Grand total	310,669.00

O 8.

IMPROVEMENT OF BRUNSWICK HARBOR, GEORGIA.

Appropriations for this improvement under the Engineer Department have heretofore been made for the removal of a shoal in East River opposite the lower part of the city. The act of Congress approved June 13, 1902, provided also for the improvement of the bar, which work had theretofore been carried on by direct contract between Congress and a private individual. * * * It also provided for dredging in Academy Creek to an amount not to exceed $5,000.

* * * * * * *

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Dredging operations have been continued throughout the fiscal year, in the inner harbor, by the Morris & Cumings Dredging Company, under their contract of November 19, 1902, the total amount of material removed being 243,289.3 cubic yards. This work has resulted in a channel through the long shoal in East River with a minimum width of 150 feet and a least depth of 21 feet at mean low water. The mean rise and fall of the tide in the inner harbor is 7 feet. The dredging here is about 75 per cent completed. A map,[a] showing progress of the work, accompanies this report.

The small amount of dredging done in Academy Creek during the previous fiscal year created a narrow channel about 30 feet wide with a depth of only 18 feet at mean low water. This has shoaled in places so that there is now only 15 feet at mean low water.

The training wall is in good condition, but would be much more effective if raised about 2 feet.

The U. S. dredge *Cumberland* removed from the main shoal on Brunswick outer bar, between January 12, 1904, and April 13, 1904, 141,472 cubic yards of material, completing about 40 per cent of the project. This work has resulted in a navigable channel across the outer, or Goodyear, shoal with a controlling depth of 19 feet at mean low water. On the inner shoal of the old channel now in use the controlling depth is 18 feet at mean low water. In April, 1904, the *Cumberland* was transferred to emergency work in the Delaware River, under orders of Maj. J. C. Sanford, Corps of Engineers.

A map showing conditions on the outer bar accompanies this report.

A combination boat and storehouse was constructed at a cost of $500.

The suboffice, located at Fernandina, Fla., was removed to the new Government building at Brunswick.

Of the total amount expended during the fiscal year $51,753.96 was for dredging under contract at 20 cents per cubic yard; $15,305.45 for operating the U. S. dredge *Cumberland*, the cost per cubic yard for dredging being 9.8 cents, and $500 for the construction of combined boat and storehouse. These amounts include contingencies.

It is proposed to expend the available balances and additional appropriation recommended in completing and maintaining the improvement of Brunswick inner harbor and outer bar by dredging and the raising of the training wall, and providing a channel of the requisite width and depth in Academy Creek.

COMMERCE AND NAVIGATION.

Information in regard to the commerce of Brunswick before the improvement will be found on page 1523 of the Report of the Chief of Engineers for 1897.

The chief articles of export are cotton, lumber, and naval stores, of which the shipments for the year 1903 were as follows: Of cotton, 138,245 bales; of lumber, 318,742,316 feet, and of naval stores, 58,174 barrels of turpentine and 197,108 barrels of rosin.

The regular lines of steamships established between this port and New York and Boston comprise a total of 12 steamers. During the year 1903 they made 100 round trips and carried 150,543 tons of freight.

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[a] Not printed.

On the inland waters there are a number of small steamers plying between Brunswick and adjacent ports, besides numerous schooners and small sailboats. It is estimated that for the year 1903 this portion of the commerce amounted to 17,470 tons, valued at $1,747,000.

The total tonnage of the port, inward and outward bound, coastwise and foreign, during 1903 was 1,502,996 tons, valued at $30,923,932.

Money statement.

July 1, 1903, balance unexpended	$137,490.39
June 30, 1904, amount expended during fiscal year, for works of improvement	67,059.41
July 1, 1904, balance unexpended	70,430.98
July 1, 1904, outstanding liabilities	18,637.42
July 1, 1904, balance available	51,793.56
July 1, 1904, amount covered by uncompleted contracts	26,043.45
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	40,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Since the work of improvement was begun the following appropriations have been made:

By act of Congress of—		
July 4, 1836		$10,000
March 3, 1879		20,000
June 14, 1880		10,000
March 3, 1881		5,000
August 2, 1882		25,000
July 5, 1884		10,000
August 5, 1886		22,500
August 11, 1888		35,000
September 19, 1890		35,000
July 13, 1892		27,500
Total		200,000
For maintenance:		
August 18, 1894		10,000
June 3, 1896		15,000
March 3, 1899		10,000
Aggregate		235,000
By act of Congress of June 13, 1902:		
Outer bar	$40,000	
Inner harbor	120,000	
Academy Creek	5,000	
		165,000
Total of all appropriations		400,000

CONTRACT IN FORCE.

Name and address of contractor: Morris & Cumings Dredging Company, New York, N. Y.

Character and amount of work: 560,000 cubic yards; dredging.

Rate per cubic yard: 20 cents.

Date of approval: December 11, 1902.

Work begun: February 19, 1903.

Expires: March 19, 1904.[a]

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[a] Time of completion extended; no specific date fixed.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels and commerce at Brunswick, Ga., 1903.

	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Arrived	602	678,937	10,301	20	13,955	210	72	56,088	1,037	694	748,980	11,548
Cleared	564	622,783	9,339	5	2,960	47	109	109,803	1,806	778	735,546	11,192

Commerce (coastwise and foreign), 1903.

Value of exports	$16,347,060.00
Value of imports	12,829,951.00
Total collection	6,591.54

Statement of receipts of naval stores, 1903.

Rosin	barrels	197,108
Spirits	do	58,174

O 9.

IMPROVEMENT OF INSIDE WATER ROUTE BETWEEN SAVANNAH, GEORGIA, AND FERNANDINA, FLORIDA.

The description of this route will be found in the Report of the Chief of Engineers for 1900, page 1953, and the waters forming it are also shown on Coast Survey Charts Nos. 156 and 157.

* * * * * * *

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Dredging operations were begun on December 7, 1903, by George T. Warner, under his contract of March 28, 1903, and continued up to April 1, 1904, at which time work was suspended owing to the seizure by the United States marshal of the dredge, which the contractor had chartered, in connection with legal proceedings involving the owner of the dredge. At the close of the fiscal year the contractor had not been able to secure another dredge with which to complete his contract. During the time the contractor was at work he removed a total of 53,129 cubic yards from Jekyl Creek and 3,500 cubic yards from the Dividings. There still remain about 9,000 cubic yards to be removed from this latter locality under the contract.

The proportion of the approved project accomplished up to June 30, 1904, is 50 per cent.

The amount expended during the fiscal year, $11,917.86, was for dredging under contract, at 16¾ cents per cubic yard, and includes contingencies.

It is proposed to apply available balances and additional appropriation recommended toward completing the dredging at the Dividings and providing the project depth at the various shoals between Savannah and Fernandina.

COMMERCE AND NAVIGATION.

A detailed discussion of the commerce over this route will be found in the Report of the Chief of Engineers for 1901, page 1653.

The commerce over this route is carried on, to a large extent, by small schooners, and it is almost impossible to obtain authentic information as to its amount and value. On the lower end of the route there are several small steamboats, making regular trips between Brunswick, Darien, Fernandina and St. Simons, and Cumberland Island and the Satilla River. During the calendar year 1903 these steamboats, and such schooners as it has been possible to obtain information from, carried over the route 25,042 tons of freight, valued at about $2,000,000.

In addition to this it is estimated there were rafted over this route, during the same period, about 150,000,000 feet B. M. of timber, valued at about $1,500,000.

None of this commerce went over the entire route.

Money statement.

July 1, 1903, balance unexpended		$14,566.16
June 30, 1904, amount expended during fiscal year, for works of improvement		11,917.86
July 1, 1904, balance unexpended		2,648.30
July 1, 1904, amount covered by uncompleted contracts		1,514.64
Amount (estimated) required for completion of existing project		41,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$41,000.00	
For maintenance of improvement	15,000.00	
		56,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Previous to the existing project there were appropriated as follows:

Parsons cut or Romerly marshes, Georgia:	
Act of Congress approved—	
August 2, 1882	$10,000.00
July 5, 1884	10,000.00
August 5, 1886	17,475.00
August 11, 1888	4,633.77
Total by United States	42,108.77
From Georgia and Florida Steamboat Company	5,000.00
Total	47,108.77
Jekyl Creek, Georgia:	
Act of Congress approved—	
August 11, 1888	5,000.00
September 19, 1890	7,500.00
July 13, 1892	7,500.00
August 18, 1894	4,000.00
Total	24,000.00

Since the existing project for improving this route was adopted four appropriations, aggregating $64,000, have been made, as follows:

Inside route:	
Act of Congress approved—	
July 13, 1892	$15,000.00
August 18, 1894	20,000.00
June 3, 1896	14,000.00
June 13, 1902	15,000.00
	64,000.00
Making a total of	135,108.77

CONTRACT IN FORCE.

Contractor: George T. Warner, Savannah, Ga.
Character of work: Dredging—93,000 cubic yards.
Rate: 16¾ cents per cubic yard.
Date of approval: April 16, 1903.
Work begun: December 7, 1903.
Expires: May 16, 1904.[a]

O 10.

IMPROVEMENT OF CUMBERLAND SOUND, GEORGIA AND FLORIDA.

The entrance to Cumberland Sound is situated between Cumberland Island, Georgia, and Amelia Island, Florida. The principal port is Fernandina, in the State of Florida.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Dredging.—The U. S. dredge *Cumberland* removed 166,479 cubic yards of material from the north jetty channel during the months of September, October, and November, 1903. The working of the dredge was very much delayed by the breaking of the suction pumps, caused from faulty construction of the valve gearing of distributing pipes.

Jetty work.—At the north jetty there were placed under contract with Christie, Lowe & Heyworth 1,499.91 tons of first-class stone to raise low places in the jetty; 6,922.5 tons of second-class and third-class stone for riprapping portions of the south side of the jetty to prevent scouring and undermining, and 1,685.3 tons of second-class stone on the shore end, between high and low water marks, where much settling was taking place and the jetty being flanked. At the south jetty the contractors placed 513.29 tons of stone to fill low places.

The contract for the construction of the jetties was completed August 7, 1903. The total amount of stone placed on the two jetties under the contract was 376,987.02 tons of first class, 201,329.17 tons second class, and 100,664.57 tons third class.

To prevent undermining and flanking of the shore end of the north jetty, where settlement was rapidly taking place, 1,197.9 tons of stone were placed and 1,500 sand bags and 300 cubic yards of brush were used to stop the flow of water through the jetty. This work was done by hired labor and the purchase of materials in open market.

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[a] Extended; no specific date fixed.

Breach on Cumberland Island.—The breach in the beach on Cumberland Island, referred to on page 1169 of the Annual Report of the Chief of Engineers for 1903, deepened and widened so rapidly in the fall of 1903 that the safety of the improvements in Cumberland Sound was threatened, and it became necessary to take immediate steps to close the breach by the construction of a dike. Emergency contracts were entered into with Merrill-Stevens Company, of Jacksonville, Fla., on January 9, 1904, for the furnishing of piling, in place, in dike, and with Roderick G. Ross, of the same place, for furnishing the necessary stone. Under these two contracts 1,200 piling were driven and 2,500 cubic yards of stone furnished. The contract with Roderick G. Ross was completed April 1, 1904, and that with Merrill-Stevens Company on April 13, 1904. It was afterwards found necessary to further extend the dike, and an arrangement was made with the previous contractors to drive the necessary piling and furnish the additional stone as open market purchases at previous contract rates. Under this arrangement an additional 1,434 piles were driven and 1,803 cubic yards of stone furnished. The making of the necessary brush bundles and the placing of these and the stone in the dike was done by hired labor.

On June 30, 1904, all piling required for the dike had been driven and the brush and stone filling had been completed for a distance of 4,300 feet. The dike is 6,900 feet long and extends from the inner end of the north jetty to the high ground at Dungeness. A map showing this work accompanies this report.

At the close of the fiscal year there had been placed in the dike 2,364 piling, 16,287 cubic yards of brush bundles, 2,703 cubic yards of stone, 270 cross-ties, 200 lineal feet of waling, and 4,000 feet of 1-inch sheathing, and there were on hand, ready to be placed in the work, 1,600 cubic yards of stone and 1,100 cubic yards of brush bundles.

CONDITION OF WORKS OF IMPROVEMENT.

North jetty.—Some slight settlement has occurred in places and some rock displaced by storms, but there is no need of repairs at this time. The raising of the shore end, with the stoppage of the flow through same, has produced rapid sanding up on both sides of the jetty.

South jetty.—The inner end of this jetty requires early attention, recent storms having scoured the sand from around it, causing the jetty to be flanked. Between stations 2100 and 2400 the jetty has settled to low water and needs raising. From station 2400 to 7500 it is in good condition. Beyond station 7500 the jetty needs to be raised to high water and its outer end should be well protected.

Breach on Cumberland Island.—The dike work done here has proven very effective; has stopped the flow of water through the breach, and is causing the beach to build up rapidly.

Changes in jetty channel.—The large body of sand between the jetties has moved rapidly seaward during the past year, the advance being 1,300 feet—twice as much as for the year previous.

The movement of the shoal is directly seaward, with no tendency as yet to move to the southeast.

The inner 24-foot curve of the channel along the south jetty advanced 2,500 feet during the past year and a deep hole, with 30 feet or over, and 3,000 feet long, formed along and inside the jetty. Another deep pocket is forming on the south side of the jetty, with the same depth, where the jetty is below low water, due to the heavy overfall.

The present ship channel, on the north side, is narrowing up on the inner end and has shoaled up 2 feet within the past six months. With the rapid changes occurring it will be but a short time before the north channel will have to be abandoned by shipping for the channel now rapidly opening up on the south side.

A map[a] showing conditions at Cumberland Sound accompanies this report.

So far as the required depth is concerned the project may be considered as completed, and further expenditure of funds might be confined to the maintenance of existing works of improvement.

Of the total amount expended during the fiscal year, $114,850.71 was for jetty construction; $42,906.50 for dike work, and $15,065.96 for operating the dredge *Cumberland*, the cost per cubic yard for dredging being 8.1 cents, and $26,049.92 for coppering hull and repairs to dredge. These amounts include cost of surveys and other contingencies of the work.

It is proposed to expend available balances and additional appropriation recommended in raising the south jetty at its inner end so as to stop the present break and prevent further flanking; to raise this jetty to mean high water from station 7500 to 8700 and protect its outer end; to complete construction of dike on Cumberland Island, and to do such dredging as may be necessary to maintain a navigable channel.

COMMERCE AND NAVIGATION.

Neglecting the commerce of St. Marys, Ga., the total commerce of the harbor of Fernandina during the calendar year 1903 amounted to 625,720 tons, with a value of $6,963,773. The details of this commerce are given in the tables appended hereto.

Money statement.

July 1, 1903, balance unexpended		[b]$250,044.56
Amount appropriated by sundry civil act approved April 28, 1904		55,000.00
		305,044.56
June 30, 1904, amount expended during fiscal year, for works of improvement		198,873.09
July 1, 1904, balance unexpended		106,171.47
July 1, 1904, outstanding liabilities		9,371.37
July 1, 1904, balance available		96,800.10
Amount (estimated) required for completion of existing project		40,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$40,000.00	
For maintenance of improvement	300,000.00	
		340,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

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[a] Not printed.

[b] Reduced 50 cents on account of Treasury settlement during fiscal year 1903.

AMOUNT AND DATE OF ALL APPROPRIATIONS.

Under the original project for improving Cumberland Sound the following appropriations were made for the work:

By act of Congress of—	
June 14, 1880	$30,000
March 3, 1881	100,000
August 2, 1882	50,000
July 5, 1884	75,000
August 5, 1886	112,500
August 11, 1888	112,500
Total	480,000

Under the revised project of improvement the following appropriations were made:

By act of Congress of—	
September 19, 1890	$112,500
July 13, 1892	170,000
August 17, 1894	170,000
Total	452,500

Under the existing project of improvement the following appropriations have been made:

By act of Congress of—	
June 3, 1896	$5,000
June 4, 1897	350,000
July 19, 1897	50,000
July 1, 1898	450,000
March 3, 1899	400,000
March 3, 1901	200,000
June 28, 1902	400,000
March 3, 1903	400,000
April 28, 1904	55,000
Total	2,310,000
Grand total	3,242,500

CONTRACTS IN FORCE.

Name and address of contractor.	Amount and character of work.	Rate.	Date of approval.	Work begun.	Expires.
Merrill-Stevens Co., Jacksonville, Fla.[a]	Furnishing 1,200 piling in place in dike.	[b] $4.00	Emergency contract; no approval.	Feb. 4, 1904	Apr. 9, 1904.
Roderick G. Ross, Jacksonville, Fla.[c]	Furnishing 2,500 cubic yards stone.	[d] 3.87	....do	Feb. 2, 1904	45 days after date of commencement.

Name and address of contractor.	Character of work.	First-class stone, per ton (185,000 tons).	Second-class stone, per ton (220,000 tons).	Third-class stone, per ton (110,000 tons).	Mattresses, per square yard (30,000 yards).	Date of approval.	Work begun.	Expires.
					Cents.			
Christie, Lowe & Heyworth, Chicago, Ill.[e]	Jetty	$2.15	$2.15	$1.90	70	Aug. 30, 1900	Nov. 1, 1900	Within 4 years from commencement of work, subject to the provisions of paragraph 53 of the specifications.

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[a] Extended; no specific date fixed; completed April 13, 1904.

[b] Per pile.

[c] Completed April 1, 1904.

[d] Per cubic yard.

[e] Completed August 7, 1903.

COMMERCIAL STATISTICS.

Arrivals and clearances of vessels and commerce at Fernandina, Fla., 1903.

	Coastwise.			Foreign ports.						Total.		
				American vessels.			Foreign vessels.					
	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.	No.	Tons.	Crew.
Arrived	351	214,867	2,913	66	70,713	1,173	10	6,570	90	427	292,150	4,116
Cleared	329	190,216	2,570	104	134,139	2,046	9	4,880	72	442	329,235	4,688

COMMERCE.

Value of exports:	
Foreign	$5,444,967.00
Coastwise	1,075,000.00
Value of imports:	
Foreign	65,750.00
Coastwise	15,000.00
Total commerce	6,600,717.00
Duties collected	1,600.44

O II.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

The bidder, to whom award was made under ten-days' notice, for removal of wreck of the schooner *Livingston*, in Savannah Harbor, having failed to carry out his agreement, the wreck was removed by the U. S. snag boat *Tugaloo* at a cost of $406.07. The work was completed on October 27, 1903, and the remaining balance of the allotment of $1,000, made by the Secretary of War on May 22, 1903, viz, $593.93, was returned to the Treasury on November 28, 1903.

On August 8, 1903, an emergency contract was made with William H. Virden, of Tampa, Fla., for the removal of the wrecks of the *City of Austin*, *Franconia*, and *Puntalunos*, in Cumberland Sound, for which work an allotment of $9,570 was made by the Secretary of War on May 21, 1903. The contract price for the removal of the three wrecks was $5,990. Work was begun September 7, 1903, on the wreck *Puntalunos* and at the close of the fiscal year the contractor had practically completed the removal of this wreck and that of the *City of Austin*. The wreck of the *Franconia* had been blown to pieces with dynamite, but the wreckage had not yet been removed. The amount expended during the fiscal year, $1,279.85, was for expenses incurred in connection with the supervision of the work, part of which is chargeable to the contractor under the terms of the extension granted for the completion of his contract.

CONTRACT IN FORCE.

Contractor: Wm. H. Virden, Tampa, Fla.
Character of work: Removal of three wrecks in Cumberland Sound.
Amount of contract: $5,990.
Date of approval: Emergency contract; no approval.
Work begun: September 7, 1903.
Expires: December 8, 1903.[a]

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[a] Extended. No specific date fixed.

O 12.

PRELIMINARY EXAMINATION AND SURVEY OF CLUB AND PLANTATION CREEKS, GEORGIA.

[Printed in House Doc. No. 159, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 9, 1903.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated August 15 and October 14, 1903, with map,[a] by Lieut. Col. James B. Quinn, Corps of Engineers, on preliminary examination and survey, respectively, ordered by the river and harbor act approved June 13, 1902, of Club and Plantation creeks, Georgia, "with a view to providing an inside water route from the Altamaha River into the port of Brunswick."

The only connecting water route now available between the Altamaha River and the port of Brunswick crosses St. Simon Sound, which during rough weather is dangerous for log rafts and light-draft river vessels. It appears that the risks of navigating St. Simon Sound are so great as almost to prevent the development of commerce between the Altamaha River system, embracing about 450 miles of navigable waterway, and its natural commercial outlet at Brunswick. The proposed channel via Club and Plantation creeks would afford a safe passage in all kinds of weather for the river traffic, and would also form an improved link in the inland waterway between Savannah and Fernandina. In the opinion of the local officer the locality is worthy of improvement by the General Government.

These reports have been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and attention is respectfully invited to the Board's report of December 2, 1903, in sixth indorsement thereon. In concluding its report the Board says:

> Having in mind the commercial advantages that would result from the proposed improvement, the Board believes the cost thereof to be reasonable, and that it is desirable for the United States to undertake the improvement of Club and Plantation creeks to a depth of 7 feet, in the manner proposed by the district officer, at an estimated cost of $40,700.

I concur in the views thus expressed by the Board.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

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[a] Not reprinted; printed in House Document No. 159, Fifty-eighth Congress, second session.

REPORT OF LIEUT. COL. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., August 15, 1903.

GENERAL: In pursuance of the instructions contained in your letter of June 23, 1902, I have the honor to report that I caused a preliminary examination of Club and Plantation creeks, Georgia, to be made by Mr. James H. Bacon, assistant engineer. From personal information I concur in the views regarding the worthiness of the improvement as expressed in his report, a copy of which is hereto appended.

It is estimated that a survey would cost $500.

Very respectfully,

JAMES B. QUINN,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 19, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By order of the Acting Chief of Engineers:

H. F. HODGES,
Major, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., August 21, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of Club and Plantation creeks, Georgia, "with a view to providing an inside water route from the Altamaha River into the port of Brunswick," and all other data available.

The inland route between Savannah and Fernandina passes within 6 miles of Brunswick; its near-by portions form links in the route by which a large traffic in cotton, naval stores, fertilizer, and general merchandise is carried on in light-draft steamers between that city and points on the neighboring rivers to the north and south. The most important of these rivers to the north is the Altamaha. The proposed channel via Club and Plantation creeks would afford a more sheltered route between Brunswick and the Altamaha and streams tributary and adjacent to the Altamaha. At present this commerce is seriously interfered with at times of heavy weather in St. Simon Sound.

The volume of commerce that would be affected beneficially by the proposed channel is not accurately known, but is reported to be large, and the Board believes that the contemplated improvement is desirable, provided it can be effected at a cost not greatly in excess of the district officer's preliminary estimate. The Board therefore recommends that $500 be allotted the district officer to enable him to make a survey, with accurate estimate of cost, and that he be requested to investigate and report more in detail the volume and character of commerce that would probably make use of the proposed channel. As the project for the inside route from Savannah to Fernandina contemplates a depth of 7 feet the Board requests that the district officer be asked to prepare an estimate of the cost of a 7-foot channel, as well as of the 5-foot channel proposed within, and to report his opinion as to the desirability of a 7-foot channel.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 28, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Club and Plantation creeks, Georgia, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors, in the preceding indorsement, I recommend that a survey of the locality, as proposed, be authorized.

FREDERIC V. ABBOT,
Acting Chief of Engineers.

[Fourth indorsement.]

WAR DEPARTMENT,
September 1, 1903.

Approved as recommended by the Acting Chief of Engineers.

ROBERT SHAW OLIVER,
Acting Secretary of War.

[Fifth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 19, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with report of survey and estimates, as recommended.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Sixth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 2, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The accompanying report on a survey of Club and Plantation creeks, and several communications from interested parties containing statistical information, have been duly considered by the Board of Engineers for Rivers and Harbors.

The object of the improvement contemplated by the act ordering this examination is to provide a channel from Brunswick River, Georgia, via Plantation and Club creeks, to Back River, thus connecting the port of Brunswick, Ga., with the Altamaha River. The only connecting route now available crosses St. Simon Sound, which, during rough weather, is dangerous for log rafts and light-draft river vessels. It appears that the risks of navigating St. Simon Sound are so great as almost to prevent the development of commerce between the Altamaha River system, embracing about 450 miles of navigable waterway, and its natural commercial outlet at Brunswick.

The commerce to be benefited by the proposed improvement is almost entirely prospective, but bids fair to be large and important, being variously estimated at from 50,000 to 80,000 tons per annum, and valued at about $1,000,000.

The district officer estimates that a 5-foot channel will cost $30,720, and a 7-foot channel $40,700, the bottom width in each case being 50 feet. It is believed that the cost of maintenance will be very small, but it is not susceptible of exact estimate. Inasmuch as the Club and Plantation route will form an improved link in the inland waterway between Savannah and Fernandina, the district officer recommends the adoption of the 7-foot channel.

Having in mind the commercial advantages that would result from the proposed improvement, the Board believes the cost thereof to be reasonable, and that it is desirable for the United States to undertake the improvement of Club and Plantation creeks to a depth of 7 feet, in the manner proposed by the district officer, at an estimated cost of $40,700.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

REPORT OF MR. JAMES H. BACON, ASSISTANT ENGINEER.

DARIEN, GA., *August 12, 1903.*

COLONEL: I have the honor to report that on August 10, 1903, I made a preliminary examination of Club and Plantation creeks, Georgia.

These creeks meander through the salt marsh to the south of and adjacent to the city of Brunswick, Ga. Club Creek empties into Back River, from which, by way of the inside passage, light-draft vessels may pass into the Altamaha River and its two tributaries, the Oconee and Ocmulgee rivers. This passage can be made without encountering the rough water usually found in heavy weather in St. Simon Sound. Plantation Creek runs from St. Simon Sound to a point in the Brunswick River, about 2 miles south of the city of Brunswick. At one point the two creeks are separated by a neck of marsh about 700 feet wide. The improvement desired consists in cutting a canal through this narrow neck and in the formation of a channel, about 80 feet wide and 5 feet deep at mean low water, from Brunswick River through Plantation Creek, the canal, and Club Creek, into Back River. In this way a channel will be provided for light-draft vessels (river steamers) of large capacity from Brunswick to all points on the Altamaha River and its tributaries, the Oconee and Ocmulgee.

I am of the opinion that this improvement is a desirable one, for the following reasons:

1. The channel would afford a safe passage in all kinds of weather for light-draft steamers, which would be able to run on regular schedules.

2. A regular service of this kind is now impossible, as all steamers going north from Brunswick must cross St. Simon Sound, which is frequently too rough for light-draft steamers to navigate.

3. Light-draft steamers, plying between Brunswick and points on the three rivers mentioned, would practically control freight rates on all merchandise within their reach, whereas at present the rates are dictated by the railroads. The competition between the river boats and the railroads would necessarily reduce freight rates.

4. Through transportation by water would be afforded between all points on the Atlantic and Gulf seaboard and all points on the three rivers mentioned. There is already a line of steamers plying between Brunswick and New York, Boston, and Mobile.

5. The commerce of the region affected by the proposed improvement fully warrants the expense involved.

The head of navigation on the Oconee River is Milledgeville, Ga., a city of about 4,200 inhabitants; Macon, Ga., with a population of about 40,000, is at the head of navigation on the Ocmulgee River. Scattered along these two rivers and on the Altamaha River are numerous smaller towns. The total population that would be benefited by the improvement is about 250,000.

The outgoing freight consists of cotton, naval stores, lumber, and agricultural produce in general. The incoming freight consists of fertilizers and general merchandise. The value of the freights now carried on the three rivers is about $5,000,000 per year. This would undoubtedly be greatly increased by the proposed improvement.

From measurements taken during the preliminary examination, I estimate that about 60,000 cubic yards of material (soft mud and sand) must be excavated to form a channel of the dimensions given above. Putting the cost of dredging at 20 cents per cubic yard, makes the total cost of the improvement about $12,000. A survey (if one is considered necessary) would cost about $500.

Very respectfully,

James H. Bacon,
Assistant Engineer.

Lieut. Col. James B. Quinn,
Corps of Engineers.

SURVEY OF CLUB AND PLANTATION CREEKS, GEORGIA.

United States Engineer Office,
Savannah, Ga., October 14, 1903.

General: In pursuance of instructions contained in letter from your office, dated September 3, 1903, I have the honor to submit the following report upon a survey of Club and Plantation creeks, Georgia.

As was outlined in a previous report, the object of the improvement sought is to give a safe interior route between the Altamaha River and the harbor at Brunswick, Ga., the desirability of which is more fully set forth in the correspondence[a] submitted with this report.

Club and Plantation creeks come very nearly together at one point, and but little dredging will be required to enable vessels to pass from one to the other.

Plantation Creek is rather narrow and crooked, and to render it convenient for the passage of vessels it is deemed advisable to straighten it a little, as the additional dredging would not exceed 30,000 cubic yards for a 7-foot channel and less for a 5-foot.

These two creeks run through marshy land, and all excavated channels would require easy side slopes of from 1:9 to 1:5. These slopes have been assumed in making the calculations, the bottom width being taken as 50 feet.

Estimate.

	5-foot channel.	7-foot channel.
	Cubic yards.	*Cubic yards.*
Club Creek to Plantation Creek	15,200	19,000
Cutting off bend in Plantation Creek	110,000	140,000
Outlet to marsh line, Plantation Creek to Turtle River	25,000	36,000
Outlet from marsh line to deep water, Turtle River	3,400	8,500
Total	153,600	203,500

The material to be dredged consists of mud and sand, with occasional small shells, and if the hydraulic method of removal is adopted will cost not to exceed 20 cents per cubic yard to excavate. At this price the 5-foot channel will cost $30,720 and the 7-foot channel $40,700.

It is believed that the tidal flow will be in quantity and direction favorable to the maintenance of the dredged channels after the improvement is completed.

The difference between a 5-foot channel and a 7-foot channel is less than $10,000, and in view of its secure location it is my opinion that a 7-foot channel would be desirable, since there may occasionally be conditions which will render this route a desirable portion of the inside route between Savannah and Fernandina.

Taken in connection with the existing inland route between Savannah and Fernandina and the prospective advantages to commerce which are indicated as possible to be realized if the improvement is consummated, I believe that the circumstances and conditions warrant the construction of the 7-foot channel as recommended.

Very respectfully,

James B. Quinn,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

O 13.

PRELIMINARY EXAMINATION OF FREDERICA RIVER, GEORGIA.

[Printed in House Doc. No. 220, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 11, 1903.

Sir: I have the honor to submit herewith for transmission to Congress a copy of a report dated August 15, 1903, by Lieut. Col. James B. Quinn, Corps of Engineers, on preliminary examination of Frederica River, Georgia, ordered by the river and harbor act approved June 13, 1902.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of said act, and attention is respectfully invited to the Board's report of December 4, 1903, in second indorsement thereon.

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[a] Not printed.

The Frederica River forms a part of the inland waterway between Savannah, Ga., and Fernandina, Fla., which is now under improvement by the General Government, the project therefor providing for obtaining a channel depth of 7 feet. It is understood that the improvement contemplated by the item in the act is the removal of a shoal near the river's mouth to a depth greater than that called for in the approved project.

For reasons given in their reports, the local officer and the Board express the opinion, in which I concur, that it is not advisable to undertake such an extended improvement of the river as is contemplated in the act.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF LIEUT. COL. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., August 15, 1903.

GENERAL: In pursuance of the instructions contained in Department letter of June 23, 1902, I have the honor to report that I caused a preliminary examination of Frederica River, Georgia, to be made, and find that this river forms a part of the inland waterway between Savannah, Ga., and Fernandina, Fla., and has a depth at its mouth, in St. Simon Sound, greater than the depth required by the inland waterway project.

The parties interested in securing a greater depth at the mouth are the owners of a sawmill at St. Simons Mills, Ga., about 2½ miles north of the river's mouth. As this is the only interest to be benefited, the improvement is not of such general character as to justify any expenditure for work by the United States.

A survey would cost $1,000, and is not recommended.

Very respectfully,

JAMES B. QUINN,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 20, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By order of the Acting Chief of Engineers:

H. F. HODGES,
Major, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 4, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of Frederica River, Georgia, a supplemental report[a] by the same officer made at the request of the Board, containing further information, and a paper[a] prepared by interested parties.

This river forms a part of the inland waterway between Savannah, Ga., and Fernandina, Fla., the project for which provides a depth of 7 feet. The improvement contemplated by the act ordering the preliminary examination is understood to be the removal of a shoal near the mouth of the river to a greater depth than called for in the approved project for the inland waterway, in order to provide better facilities for ocean vessels loading principally with lumber at a point known as St. Simons Mills, about 2½ miles above the river's mouth. The depth desired by those interested is 23 feet at high tide. There is at present ample depth except for a distance of about 8,000 feet near the mouth, where the available depth is 19 feet at high tide (about 12 feet at low tide). It is claimed that the lack of sufficient depth necessitates the lightering of a large amount of lumber and cross-ties.

It is reported by those interested that about 35,000,000 feet (nearly 70,000 tons) of lumber and timber are shipped annually over this shoal, and that this amount would be increased if a greater depth were made available. It appears that the cost of lightering cargoes at present is about $2,600 per annum, and that this sum would be saved to the community if a depth of 23 feet at mean high water were provided. It is represented that the improvement would result in a further saving of from $8,000 to $10,000 per annum, incident to the transfer of timber shipments from Sapelo Sound to Frederica River.

To enable the Board to compare cost with probable benefits, the district officer has prepared the following preliminary estimate of the amount of work and the probable cost of providing a channel 150 feet wide and 23 feet deep, mean high water:

Material to be removed	cubic yards	300, 000
Estimated cost		$45, 000
Annual maintenance		$2, 000

Leaving out of consideration prospective benefits claimed but not certain of realization, it appears to the Board that the advantages would not outweigh the cost, and that in consequence it is not desirable for the United States to undertake the improvement of Frederica River, Georgia.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

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[a] Not printed.

O 14.

PRELIMINARY EXAMINATION OF OCONEE RIVER, GEORGIA, FROM DUBLIN TO SKULL SHOALS.

[Printed in House Doc. No. 304, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 24, 1903.

Sir: I have the honor to submit herewith for transmission to Congress a report dated August 12, 1903, by Lieut. Col. James B. Quinn, Corps of Engineers, on preliminary examination of Oconee River, Georgia, from Dublin to Skull shoals, authorized by the river and harbor act approved June 13, 1902.

Oconee River is at present under improvement by the United States from its mouth up to Milledgeville, a point about midway between Dublin and Skull shoals. In 1884–85 a little work was done in the section above Milledgeville and just below Skull shoals. For the reasons given in his report Lieutenant-Colonel Quinn does not regard that section of the river above Milledgeville to Skull shoals as worthy of further improvement by the United States.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of 1902, and attention is respectfully invited to the Board's report of December 14, 1903, in second indorsement thereon.

In concluding its report the Board expresses the opinion that the existing project for the improvement of the Oconee up to Milledgeville should be carried to completion, but that it is not desirable for the United States to undertake the improvement of the river above that point to Skull shoals, and in this opinion I concur.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF LIEUT. COL. JAMES B. QUINN, CORPS OF ENGINEERS.

United States Engineer Office,
Savannah, Ga., August 12, 1903.

General: In pursuance with the requirements of the river and harbor act of June 13, 1902, I have the honor to report the results of a preliminary examination of the Oconee River, Georgia, from Dublin to Skull shoals.

Skull shoals is about 71 miles above Milledgeville. In 1884–85 some work was done upon the portion of the river between the shoals and the railroad bridge below, a distance of 18 miles. There does not appear to have been much navigation over this stretch of river. The land on either bank of the river, over this distance, is well improved, but it is not believed that any improvement of this portion of the stream, to meet ordinary navigation requirements, would be justified by the interests involved.

Below the railroad bridge, to Milledgeville, the river is a series of rapids, with a fall of about 110 feet in 53 miles. The only system of improvement to give satisfactory navigation, or, in fact, navigation of any kind, that would be feasible would be by a series of locks and dams—entirely too expensive to be warranted by any commercial advantages, present or prospective.

The stretch of river from Skull shoals to Milledgeville is not deemed worthy of improvement by the United States.

From Milledgeville to Dublin, a distance of 68 miles, the river is capable of improvement, since the obstructions to navigation consist of snags and bars, which are manageable. This portion of the river is being improved in pursuance of the project approved in 1890, and it is expected that a channel with 3 feet depth at ordinary low water can be secured and maintained under its provisions.

No further provision for survey need be made, as there is sufficient data at hand upon which to base estimates for the improvement of the practicable portions of the river.

Above Milledgevelle the fall is so great and the rock ledges so numerous that the water-power features are of far more value to commerce than the navigation would be under the most elaborate system of improvement.

Very respectfully,

JAMES B. QUINN,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
August 18, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By order of the Acting Chief of Engineers:

H. F. HODGES,
Major, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 14, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of Oconee River, Georgia, from Dublin to Skull shoals.

The Oconee and Ocmulgee rivers unite in southeastern Georgia and form the Altamaha. Dublin is situated on the Oconee, about 110 miles above its mouth, and Skull shoals is about 144 miles above Dublin. The town of Milledgeville is located between Skull shoals and Dublin, being about 73 miles above the latter. This river has been under improvement by the United States since 1878. The existing project was adopted by Congress in 1890. It provides for a navigable channel 3 feet deep at ordinary low water from Milledgeville to the mouth, at an estimated cost of $171,000, besides from $3,000 to $5,000 per annum for maintenance. Under this project there was expended up to June 30, 1903, the sum of $90,963.99, which, added to the amount previously expended, gives a total expenditure for this work of $135,786.17.

In 1884 a survey and examination were made by order of Congress of the stretch of river between Skull shoals and the Georgia Railroad bridge, 17½ miles below Skull shoals. As a result of this survey the sum of $1,500 was appropriated and expended on this stretch; with this exception no work has been done above Milledgeville. In the report on this survey the district officer stated that this stretch of river is necessarily an isolated one, due to the fact that between the Georgia Railroad bridge and Milledgeville the slope of the river is so great that it can not be improved except by a costly system of locks and dams entirely disproportionate to the benefits to be expected therefrom. In his report upon the survey of 1890 the district officer also mentions this fact. It will be seen from the above that of the total distance of about 144 miles between Dublin and Skull shoals, 73 miles from Dublin to Milledgeville is now included in the present project. This leaves a distance of about 71 miles from Milledgeville to Skull shoals, of which 54 miles, from Milledgeville to the Georgia Railroad bridge, is so precipitous that the only means of improving it is by an expensive system of locks and dams.

There is no commerce on the river above Milledgeville at present, and little or none for a distance of about 23 miles below, as this stretch of river is still in bad condition and is only made use of at high stages. In reply to a query from the Board, the district officer states that "the amount now remaining to be appropriated for the improvement of this river is $114,900. It is believed that this is sufficient to complete the improvement, provided funds are regularly and adequately supplied by Congress; otherwise the cost will be materially increased."

Milledgeville is the natural head of navigation on the Oconee. The river is susceptible of improvement at reasonable cost to this point, but no farther. The cost of an adequate improvement above Milledgeville would, in the opinion of the Board, be entirely incommensurate with the cost thereof. The Board believes that the existing project for the improvement of the Oconee to Milledgeville should be carried to completion, but that it is not desirable for the United States to undertake the improvement of Oconee River to Skull shoals, and the Board so recommends.

For the Board:

Chas. J. Allen,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

O 15.

SURVEY OF SKIDAWAY NARROWS, GEORGIA.

[Printed in House Doc. No. 450, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, January 19, 1904.

Sir: I have the honor to submit herewith, for transmission to Congress, report of August 12, 1903, by Lieut. Col. James B. Quinn, Corps of Engineers, on survey of Skidaway Narrows, Georgia, authorized by the river and harbor act approved June 13, 1902, in the following terms:

> A survey and an estimate of the cost of improving Skidaway Narrows, connecting Isle of Hope River with Burnside River, for a channel seventy-five feet wide and six feet at mean low water.

A preliminary examination of this locality was authorized by the emergency river and harbor act approved June 6, 1900, and in report thereon, dated September 26, 1900, by Capt. Cassius E. Gillette, Corps of Engineers (printed in the Annual Report of the Chief of Engineers for 1901, p. 1728), the opinion was expressed that Skidaway Narrows was not worthy of improvement by the United States.

As a result of the present investigation Lieutenant-Colonel Quinn presents a plan for securing a channel of 75 feet width at bottom, with 6 feet depth at mean low tide, as required by the terms of the act, at an estimated cost of $55,000. For the reasons given he regards the proposed improvement as worthy of being undertaken.

Attention is invited, however, to the statement made by the local officer that a more economical, direct, and better located route can be secured to the west of the Narrows.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and attention is respectfully invited to the conclusions of the Board in its report of January 11, 1904, as follows:

> The approved project for the inside waterway between Savannah, Ga., and Fernandina, Fla., follows the line of Romerly Marsh and Habersham Creek. The effect of the proposed improvement of Skidaway Narrows would be to create an additional or alternative route for a portion of the approved route, to wit, the portion between Wilmington and Vernon rivers. The route of the approved project is equally short, cheaper, and more favorable for navigation than the route via Skidaway Narrows.
>
> In view of the facts above stated, the Board does not recommend as advisable the improvement by the United States of Skidaway Narrows, Georgia.

I concur in the views thus expressed by the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF LIEUT. COL. JAMES B. QUINN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., August 12, 1903.

GENERAL: In pursuance of the requirements of the river and harbor act of June 13, 1902, I have the honor to submit a report upon the recent survey of Skidaway Narrows, Georgia.

Skidaway Narrows is a narrow, tortuous, and shallow water course connecting the Skidaway and Burnside rivers, and forms a part of the inside waterway between Savannah, Ga., and Fernandina, Fla. Although its navigation is difficult at present, it is much used by the small craft engaged in the commerce between the points above named on account of its well-protected position and the shorter distance it affords. The "Narrows" proper is only one-half mile in length, but as the approaches thereto will have to be improved, the total distance from proper depth in Burnside River to Skidaway River is 2 miles.

The investigation of the route between the two rivers shows that the "Narrows" do not present the advantages necessary to determine its selection for improvement. A more economical, direct, and better located route can be secured to the west of the "Narrows." This proposed route is shown upon the accompanying map.

The range of tide at this point is about 8 feet, and it is at the meeting point of the tides of the Burnside and Skidaway rivers. As the rivers carry very little sediment, the danger of the silting up of a channel at this place would be negligible, and but little money for maintenance would therefore be required.

The material to be removed is mostly mud and sand, with some compacted shells and sand at places, and does not present any unusual characteristics to render the work of removal difficult or expensive.

COST.

To obtain the required channel of 75 feet width at bottom with 6 feet depth at mean low tide will require—

Dredging 350,000 cubic yards, at 13 cents	$45,500
Three cut-off dikes	2,500
Contingencies	7,000
Total	55,000

COMMERCE.

The exact value of the commerce which pursues the present route is difficult to estimate, since it consists of numerous small craft, carrying oysters and farm products, and numerous rafts of lumber. In case of improvement much of the commerce which follows the longer route would come this way.

ADVANTAGES.

The proposed route is 6½ miles shorter than the present route by way of Parsons Cut and Wassaw Creek. It is much farther inland and better protected from storms such as interfere with navigation by small boats of the open areas in Ossabaw and Wassaw sounds. It is capable of being made secure from enterprises of an enemy in time of war, and therefore possesses a valuable military advantage over all other routes. The delays to sailing craft due to the condition of the tides would be far less by this route than by any other, and the narrow portion is much less.

The completion of this improvement would greatly benefit a commerce which at present is much restricted, and result in the development of many industries which are at present held in abeyance on account of inadequate navigation facilities. The improvement is therefore deemed worthy.

Very respectfully,
JAMES B. QUINN,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 18, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By order of the Acting Chief of Engineers:

H. F. HODGES,
Major, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., August 21, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

In reporting upon the desirability of undertaking improvements the Board of Engineers for Rivers and Harbors is obliged by law to "have in view the amount and character of commerce existing or reasonably prospective which will be benefitted by the improvement, and the relation of the ultimate cost of such work, both as to cost of construction and maintenance, to the public commercial interests involved."

For information as to the commercial benefit of proposed works the Board is under the necessity of relying largely on the reports of district officers. The within report does not afford for the case in hand all the needed information in sufficient detail.

The Board accordingly requests that the district officer be asked to supply such further data on this subject as may be in his possession or may be easily collected. The Board would like to know, for example, what volume of commerce follows the route via Wilmington River, Parsons Cut, Wassaw Creek, etc.; what part of this would probably use the proposed channel via Burnside and Isle of Hope rivers; and what increase of commerce might be expected to follow from the greater convenience of the latter route.

For the Board:

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 11, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, inviting attention to the accompanying report by Lieutenant-Colonel Quinn.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Fourth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 11, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within and the accompanying reports of the district officer on a survey of Skidaway Narrows, Georgia, and other data available.

The approved project for the inside waterway between Savannah, Ga., and Fernandina, Fla., follows the line of Romerly Marsh and Habersham Creek. The effect of the proposed improvement of Skidaway Narrows would be to create an additional or alternative route for a portion of the approved route, to wit, the portion between Wilmington and Vernon rivers. The route of the approved project is equally short, cheaper, and more favorable for navigation than the route via Skidaway Narrows.

In view of the facts above stated the Board does not recommend as advisable the improvement by the United States of Skidaway Narrows, Georgia.

For the Board:

A. M. MILLER,
Lieut. Col., Corps of Engineers,
Senior Member Present.

SUPPLEMENTARY REPORT ON SURVEY.

UNITED STATES ENGINEER OFFICE
Savannah, Ga., September 4, 1903.

GENERAL: In compliance with first indorsement, Office Chief of Engineers, dated August 28, 1903, I have the honor to submit the following facts concerning the commerce, present and prospective, which will be affected by the proposed improvement of Skidaway Narrows, Georgia.

* * * * * * *

From the best information obtainable the following figures show the commerce for the calendar year 1902 over the present route, via Wilmington River, Parsons Cut, Wassaw Creek, etc., viz:

	Quantity.	Value.
Oysters .... bushels..	326,915	$163,457.50
Rice .... do....	124,344	124,344.00
General merchandise .... tons..	5,000	125,000.00
Total	....	412,801.50

In addition to this there is a great deal of timber towed in rafts to Savannah over this route, but I am unable to get any definite information as to its quantity.

It is expected that practically all of this commerce will follow the new route via Skidaway Narrows.

It would appear that the increase in commerce which might be expected to follow from the greater convenience of the route via Skidaway Narrows would be considerable. Much uncultivated land along the proposed route would no doubt be improved, since the products could be easily brought to Savannah in steamers and small schooners, whereas the only present means of transportation is by rowboats. A great deal of the freight which is now shipped by rail from Savannah to Darien, Brunswick, Fernandina, and Jacksonville would be sent by steamer via this route. This is not done now owing to the exposed sounds necessary to be crossed and the delay occasioned by waiting on the tides.

I am reliably informed that a regular schedule of steamers will be established between Savannah and Jacksonville as soon as the proposed improvement of Skidaway Narrows is completed.

Very respectfully,

James B. Quinn,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A

APPENDIX P.

IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN FLORIDA.

REPORT OF CAPT. FRANCIS R. SHUNK, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. St. Johns River, Florida.
2. St. Johns River at Orange Mills Flats, Florida.
3. Volusia Bar, Florida.
4. Oklawaha River, Florida.
5. St. Augustine Harbor, Florida.
6. Indian River, Florida.
7. Biscayne Bay, Florida.
8. Harbor at Key West, Florida, and entrance thereto.
9. Kissimmee River, Florida.
10. Orange River, Charlotte Harbor, and Caloosahatchee River, Florida.
11. Sarasota Bay, Florida.
12. Tampa Bay, Florida.
13. Hillsboro Bay, Florida.
14. Crystal, Manatee, Anclote, Suwanee, and Withlacoochee rivers, Florida.
15. Removing the water hyacinth from Florida waters.
16. Dredge for river and harbor improvements, Florida.

EXAMINATIONS AND SURVEYS.

17. Charlotte Harbor, Florida.
18. Estero Creek or River, Florida.
19. Gasparilla Sound and Lemon Bay, Florida.
20. Hillsboro Bay, Florida.
21. Key West Harbor, Florida.
22. Manatee River, Florida.

HARBOR LINES.

23. St. Johns River near Jacksonville, Florida.

United States Engineer Office,
Jacksonville, Fla., July 20, 1904.

General: I have the honor to submit herewith annual report upon the works of river and harbor improvement in this district, for the fiscal year ending June 30, 1904.

Very respectfully, your obedient servant,

Francis R. Shunk,
Captain, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

P 1.

IMPROVEMENT OF ST. JOHNS RIVER, FLORIDA.

For description, original project, results, etc., see summary, page 280, and Reports of Chief of Engineers for 1896, pages 1305–1312; for 1895, pages 1586–1604 (the latter being a report upon a survey of

St. Johns River, Florida, from Jacksonville to the ocean, with a view to securing a 24-foot channel); and for 1898, pages 1327–1330.

The funds appropriated and authorized by act of June 13, 1902, are being expended in accordance with the general project of June 3, 1896, under the following supplemental project:

To raise the south jetty at the entrance to mean high water from the shore end out to station 10000.

To raise the north jetty to high water throughout its present length.

The training wall at White Shells shoal to be extended to shore from its lower end (as shown by the map) and its entire length built up to mean high water.

Similar training walls to be constructed between Long and Le Barons islands (Long Island training wall), and between Alligator and Quarantine islands (Island training wall).

All but a length of about 400 feet of the upper end of the present Island training wall to be removed.

Coon Point dam and Cut-off dam to be built up to mean high water.

Dames Point training wall to be built up to mean high water and extended upstream as shown on map.

The necessary dredging to be done to form a channel 300 feet wide and 24 feet deep at mean low water increased to 400 feet wide and 25 feet deep in the bend at Dames Point.

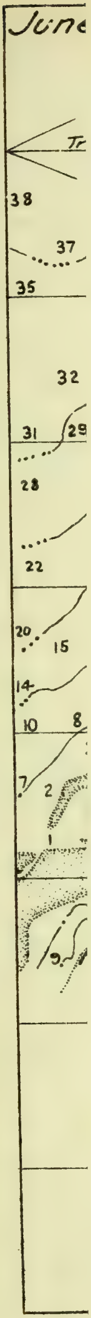
The construction of the seagoing suction dredge authorized in the act of June 13, 1902, was in progress during the year, under the charge of Maj. J. C. Sanford, Corps of Engineers, to whose report reference is invited.

The U. S. dredge *Winyah Bay* continued work on the bar at the entrance and on the shoals in the river until November 7, 1903. During the fiscal year ending June 30, 1904, this dredge removed 62,717 cubic yards from the bar at the entrance, 10,963 cubic yards from Mile Point shoal, 25,211 cubic yards from White Shells shoal, and 12,158 cubic yards from Dames Point shoal, at a cost of 17.9 cents per cubic yard, amounting to $19,865.35.

Under the contract with the Coastwise Dredging Company, entered into February 5, 1903, 1,875.6 cubic yards were removed from Dames Point shoal and 3,914.7 cubic yards from Browns Creek shoal. The progress of this work was so unsatisfactory that the contract was annulled on October 22, 1903. The contract price for this work was 21.5 cents per cubic yard. No payment was made.

Under the contract with Roderick G. Ross, entered into March 6, 1903, work continued on the jetties at the entrance until June 11, 1904, when the contract was completed. During the year 111,534.17 tons of first-class stone, 25,124.26 tons of second-class stone, and 4,947.98 cubic yards of third-class stone were placed in the north jetty, and 3,156.2 tons of first-class stone, and 264.8 tons of second-class stone were placed in the south jetty. The amount expended on this work during the fiscal year was $320,798.97.

Under the contract with Roderick G. Ross entered into June 30, 1903, work began on the training walls in the river October 6, 1903, and was still in progress at the end of the fiscal year. During this work the foundation of White Shells training wall was extended to the shore from its lower end, a distance of 1,535 feet; Long Island training wall was built from Long Island to Le Barons Island; the upper end of Coon Point dam was extended to the shore of Vicks



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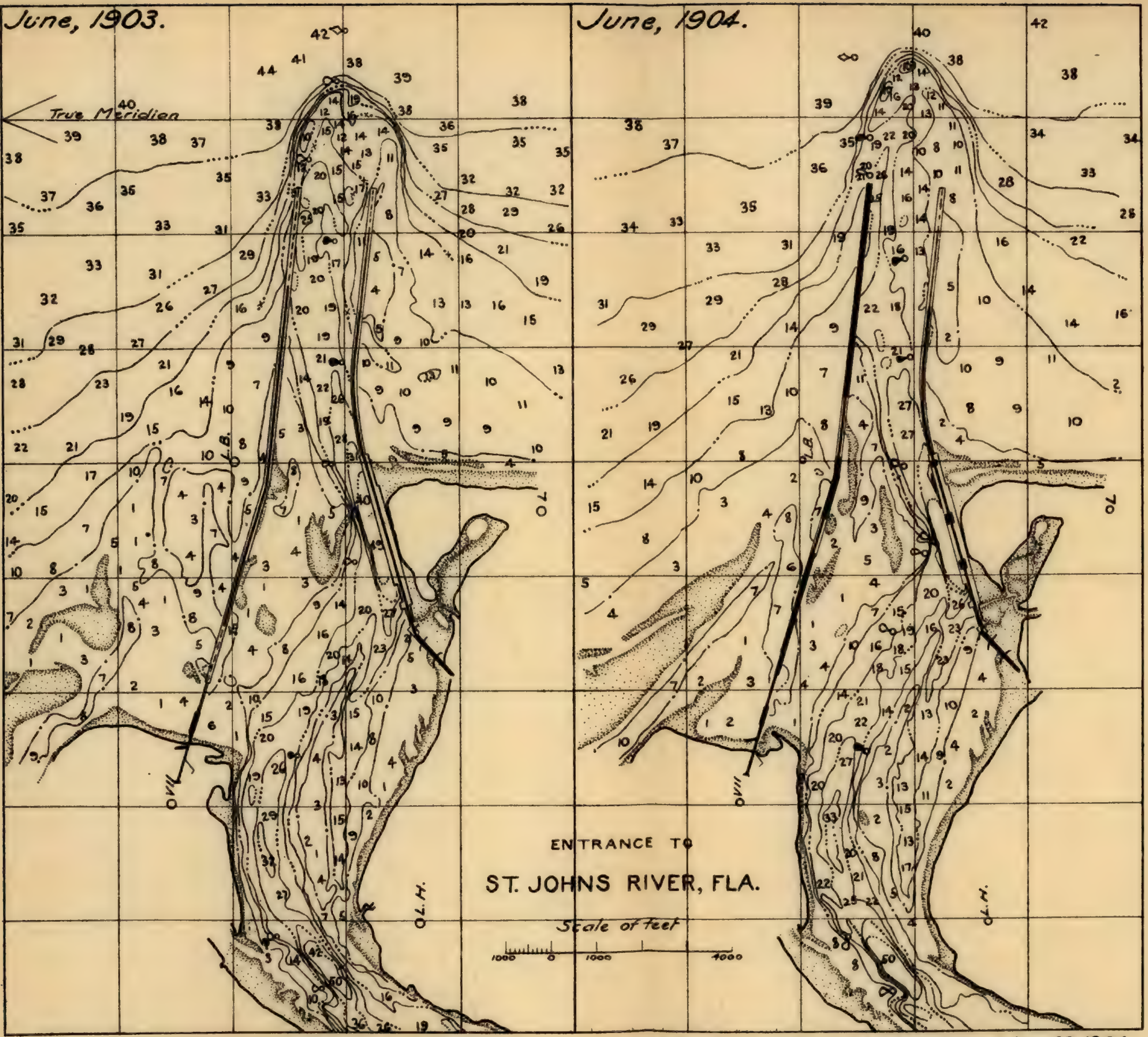

ENTRANCE TO

ST. JOHNS RIVER, FLA.

Note:

Crest of Jetties below Mean Low Water

" " " at " " "

" " " between M.L.W. and M.H.W.

" " " at or above Mean High Water

THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON D.C.

U.S. Engineer Office, Jacksonville, Fla, June 30, 1904.

To accompany annual report.

Francis R. Shunk

Captain, Corps of Engineers, U.S. Army.

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Island, which had washed away from the end of the dam a distance of about 100 feet; the foundation of Island training wall was built from a point on the old portion, about 400 feet from the upper end on Quarantine Island, to Alligator Island; the portion of the old training wall below the point of junction with the new was removed; the channel side of Quarantine Island was revetted, making Island training wall and Dames Point training wall continuous, and the foundation of Dames Point training wall was extended upstream a distance of 1,985 feet. In this work a total of 37,165.1 square yards of fascine mattress, 32,034.6 cubic yards of stone, and 293.3 cubic yards of shell were placed, and 2,741.8 cubic yards of old material were removed and placed in the new work. The amount expended on this work during the fiscal year was $60,970.06.

The construction of the river dredge *Jacksonville* began July 30, 1903. The dredge began work at Dames Point February 15, 1904. This dredge is of the hydraulic type, and was equipped with a 30-inch dredging pump and other machinery from the condemned dredge *Alpha*, belonging to the Mississippi River Commission. Much trouble has been experienced with this second-hand machinery and the type of suction head in use, which is the same as used on the Mississippi River dredges, and is not suited to the character of material encountered on this work. The results obtained with this dredge, except as a controlling factor on contract prices, have so far been unsatisfactory. New machinery is being installed as rapidly as practicable, and it is believed that satisfactory results will soon be obtained. During fourteen working days in July it is reported that 46,000 cubic yards have been removed. Up to June 30, 1904, 128,447.8 cubic yards of material had been removed by this dredge from a cut 4,133 feet long, 120 feet wide, and 25 to 26 feet deep, excepting a few places where rock was found with slightly less than 24 feet over it, at mean low water. This cut is along the outside of the turn around Dames Point. The cost of the work for running expenses and incidental repairs amounted to $19\frac{3}{10}$ cents per cubic yard. The total amount expended in connection with this dredging work was $167,828.71.

The map[a] of the survey of the entrance of the river, made in May and June, on a scale of 1 : 6,000, and a map showing the entrance in June, 1903, and June, 1904, on a scale of 1 : 30,000, are submitted herewith. The channel has continued to deepen close to the outer portion of the north jetty and its prolongation, and the sailing line over the bar is now across the line of the prolongation of the north jetty. A least depth of $19\frac{1}{2}$ feet at mean low water exists for a width of 850 feet along this line. The outer slope of the bar has advanced seaward about 600 feet. Considerable shoaling has taken place seaward of the outer end of the south jetty and along the southern side of this jetty.

The crest of the north jetty is about 2 feet above mean high water from shore out a distance of about 4,000 feet, at the level of mean high water, and from 1 to 2 feet below that plane in places, for a further distance of about 4,000 feet, at mean high water, and from 1 to 2 feet above that plane in places, for a further distance of about 2,500 feet, and about 5 feet above mean high water thence to the outer end, a distance of about 2,300 feet.

The south jetty having settled in the vicinity of station 3600 and of station 4800, was built up to about 2 feet above mean high water at these two places. Elsewhere the jetty is about the same as reported last year,

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[a] Not printed.

The available channel depth in the river is about the same as last year, 17 feet at mean low water, excepting Mile Point shoal, where shoaling has recently occurred, reducing the depth at that place to 14½ feet at mean low water. The mean range of tide is 5.22 feet on the bar at the entrance, 4 feet at Mile Point, and 1.8 feet at Dames Point.

Attention is invited to the fact that the sum of only $205,000 remains to be appropriated to complete the amount authorized in act of June 13, 1902. Including this amount, the payment of outstanding obligations and payment for work proposed under contract will leave an amount which is estimated to be only sufficient to pay the cost of operating the two dredges owned by the United States up to about March 1, 1905. Unless other funds are provided, work by hired labor will probably cease by that time, leaving the work in an incomplete condition.

It is proposed to apply the available balance to building training walls in the river and to dredging in the river by contract, and to dredging by hired labor in the river and on the bar, using the U. S. dredges *Jacksonville* and *St. Johns*, between Jacksonville and the ocean.

The additional appropriation recommended is to be applied to continuing the work of dredging between Jacksonville and the ocean by contract and hired labor, using for the latter the U. S. dredges *Jacksonville* and *St. Johns*.

Money statements.

EMERGENCY APPROPRIATION.

July 1, 1903, balance unexpended	$729.19
June 30, 1904, amount expended during fiscal year	729.19

GENERAL IMPROVEMENT.

July 1, 1903, balance unexpended		$676,351.13
Amount appropriated by sundry civil act approved April 28, 1904		395,000.00
		1,071,351.13
June 30, 1904, amount expended during fiscal year, for works of improvement		[a] 719,463.09
July 1, 1904, balance unexpended		351,888.04
July 1, 1904, outstanding liabilities		53,712.29
July 1, 1904, balance available		298,175.75
July 1, 1904, amount covered by uncompleted contracts		89,319.86
Amount (estimated) required for completion of existing project		614,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$500,000.00	
For maintenance of improvement	25,000.00	
		525,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

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[a] Includes $150,000 for construction of dredge, and $300 withdrawn for expenses of Board of Engineers on Rivers and Harbors.

APPROPRIATIONS FOR IMPROVEMENT OF ST. JOHNS RIVER, FLORIDA.

Under the original project the following appropriations were made for the work:

June 14, 1880	$125,000	September 19, 1890	$170,000
March 3, 1881	100,000	July 13, 1892	112,500
August 2, 1882	150,000	March 3, 1893	284,500
July 5, 1884	150,000		
August 5, 1886	150,000	Total	1,417,000
August 11, 1888	175,000		

Under the existing project of improvement appropriations have been made—

June 3, 1896	$200,000
March 3, 1899	200,000
June 13, 1902	[a] 350,000
March 3, 1903	350,000
April 28, 1904	395,000
Total	1,495,000
June 6, 1900 (allotment and emergency appropriation)	10,000
Aggregate	2,922,000

CONTRACTS IN FORCE.

Contractor: Roderick G. Ross.
Work: Jetty construction.
Date: March 6, 1903.
Approved: March 18, 1903.
Date of beginning: June 24, 1903.
Date of completion: As provided in specifications.
Quantities: About 90,000 tons of first-class stone, at $2.22 per ton; about 40,000 tons of second-class stone, at $2.22 per ton; about 5,000 tons third-class stone, at $2.13 per cubic yard.
Contractor: Roderick G. Ross.
Work: Training wall construction.
Date: June 30, 1903.
Approved: January 15, 1904.
Date of beginning: October 6, 1903.
Date of completion: As provided in specifications.
Quantities: 66,000 cubic yards third-class stone, at $1.83 per cubic yard; 37,000 square yards fascine mattress, at 40 cents per square yard; 18,000 cubic yards oyster shells, at $1 per cubic yard; old material placed in new work, 24,180 cubic yards, at 40 cents per cubic yard; old material placed elsewhere, 2,700 cubic yards, at 30 cents per cubic yard.
Contractor: Coastwise Dredging Company.
Work: Dredging St. Johns River, Florida.
Date: February 25, 1903.
Approved: March 24, 1903.
Date of beginning: May 27, 1903.
Date of completion: As provided in specifications. (Contract annulled.)
Quantities: About 400,000 cubic yards, at 21.5 cents per cubic yard.
Contractor: F. C. Blackmer and David Warrington.
Work: Construction of hull for hydraulic dredge. Contract price, $12,305.
Date: July 16, 1903.
Approved: July 16, 1903.
Date of beginning: August 1, 1903.
Date of completion: October 5, 1903.

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[a] And continuing contract for $950,000.

COMMERCIAL STATISTICS.

Commerce of St. Johns River, Florida, during the year ending December 31, 1903.

[Furnished by Jacksonville Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Yellow-pine lumber	401,024	Railroad iron	300
Cypress lumber	6,208	Axle grease	300
Shingles	29,125	Grain	16,400
Cross-ties	49,624	Salt	3,021
Naval stores	75,370	Oil cake	20
Cotton	8,098	Tobacco	46
Tobacco	46	Roofing slate	75
Oranges	5,968	Hay	110
Vegetables	3,535	Kainit	1,000
Sugar	4,496	Sulphate of ammonia	75
Flour	49,000	Kaolin	5,869
Bacon	65,500	Fire brick	26
Boots and shoes	2,138	Boneblack	300
Canned goods	3,700	Sash and doors	93
Coal	69,025	Wines and liquors	3,800
Fertilizers	38,838	Laths	96
Cement	6,974	Nails	41
Oil and gasoline	35,323	Miscellaneous packages	166,284
Coffee	34		
Linseed oil	194	Total	1,052,076

Arrivals and departures of vessels for the year ending December 31, 1903.

	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steam	276	721,310	259	713,194
Sailing	274		280	
Total	550	....	539	....

Estimated number of passengers carried by water	480,000
Estimated amount of total trade of neighborhood carried by water, per cent	25
Probable increase of trade were the improvement completed, per cent	200

NOTE.—From the above statement it would appear that the commerce of this port was less in 1903 than in 1902, but in the 1902 report an error was made in giving the number of cross-ties instead of the tonnage. Instead of 872,500 tons, it should have been 64,937 tons, making a difference of 807,563 tons, thus reducing the total tonnage of that year to 903,191, while that of 1903 is 1,052,467, a gain of 149,276 tons in 1903 over that of 1902.

P 2.

IMPROVEMENT OF ST. JOHNS RIVER AT ORANGE MILLS FLATS, FLORIDA.

For description, project, and work done see summary, Report of the Chief of Engineers for 1898, pages 1344–1348, and Report of the Chief of Engineers for 1901, page 1738.

The act of June 13, 1902, appropriated $30,000 for this improvement.

On October 12, 1902, a contract for dredging was entered into with P. Sanford Ross, Incorporated. Work began under this contract May 5, 1903, and was completed September 5, 1903; 25,376.4 cubic yards were removed from Orange Mills flats, 99,825.6 cubic yards from Racey

Point shoal, and 101,583.1 cubic yards from Tocoi shoal, making a total of 226,785.1 cubic yards, of which amount 113,553.2 cubic yards were dredged during the fiscal year ending June 30, 1904. For results and present condition see summary.

It is proposed to apply the additional appropriation recommended to completing the existing project by dredging.

Money statement.

July 1, 1903, balance unexpended	$23,961.68
June 30, 1904, amount expended during fiscal year, for works of improvement	23,961.68
Amount (estimated) required for completion of existing project	50,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	50,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

Act of—	
March 3, 1899	$40,000
June 13, 1902	30,000
Total	70,000

CONTRACT IN FORCE DURING FISCAL YEAR.

Contractor: P. Sanford Ross (Incorporated).
Work: Dredging St. Johns River, Orange Mills flats.
Dated: October 27, 1902.
Approved: November 11, 1902.
Date of beginning: May 5, 1903.
Date of completion: September 5, 1903.
Quantities: About 225,000 cubic yards of material at 12 cents per cubic yard.

COMMERCIAL STATISTICS.

Commerce of Orange Mills flats during the year ending December 31, 1903.

[Furnished by Board of Trade, Palatka, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cotton	200	Pineapples	1,400
Fertilizers	3,500	Railroad supplies	1,500
Fruits	1,400	Sirup, honey, etc	50
Fish and oysters	1,500	Shingles	30,000
Grain	4,000	Sash, door, and blinds	8,000
Hides	100	Turpentine and rosin	25,000
Hay	3,200	Tobacco	10
Live stock	50	Vegetables	300
Lumber	150,000		
Merchandise	38,000	Total	269,610
Oranges	1,400		

Arrivals and departures of vessels for the year ending December 31, 1903.

Kind of vessel.	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steamers	8	8,000	8	8,000
Sailing vessels	155	100,000	155	100,000
Yachts	10	....	10	....

Estimated number of passengers carried by water	150,000
Estimated percentage of total trade of neighborhood carried by water	90
Probable percentage of increase of trade were the improvement complete	100

P 3.

IMPROVEMENT OF VOLUSIA BAR, FLORIDA.

Since July, 1899, no work has been done at this place.

For description, project, and results, see summary, page 283, and the Report of Chief of Engineers for 1897, page 1550, and for 1896, pages 1313 and 1314.

The sum of $2,000 was allotted from the emergency river and harbor act of April 28, 1904. With this amount and the sum of $2,000 appropriated in act of June 13, 1902, remaining unexpended, it is proposed to dredge the channel at Volusia bar and the worst places on the river between Volusia bar and Lake Monroe, or both as may appear most desirable when the work is undertaken. It is proposed to do this work with the U. S. dredge *Florida*, now under construction. Work is expected to begin in October, 1904.

It is proposed to apply the additional appropriation recommended to maintenance of improvement.

Money statement.

July 1, 1903, balance unexpended	$2,000.00
Amount allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904	2,000.00
July 1, 1904, balance unexpended	4,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	2,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

Act of—		Act of—	
June 14, 1880	$5,000	August 18, 1894	$1,000
March 3, 1881	5,500	June 3, 1896	1,000
August 2, 1882	5,000	March 3, 1899	2,000
July 5, 1884	2,000	June 13, 1902	2,000
August 5, 1886	7,500	April 28, 1904	2,000
August 11, 1888	500		
September 19, 1890	500	Total	35,000
July 13, 1892	1,000		

COMMERCIAL STATISTICS.

Commerce of Volusia Bar, Fla., during the year ending December 31, 1903.

[Furnished by the Clyde Steamship Company.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers	5,420	Railroad supplies	160
Fruits	580	Sirup, honey, etc	10
Grain	6,200	Tobacco	38
Hides	40	Hay	1,600
Live stock	154	Vegetables	3,200
Lumber	22,150	Shingles	10
Merchandise	13,510	Sash, doors, and blinds	20
Oranges	1,850		
Turpentine and rosin	640	Total	55,922
Fish and oysters	340		

Arrivals and departures of vessels for the year ending December 31, 1903.

Kind of vessel.	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steamers	260	95,400	260	95,400

Estimated number of passengers carried by water	35,133
Estimated percentage of total trade of neighborhood carried by water	40
Probable increase of trade were the improvement completed, per cent	100

P 4.

IMPROVEMENT OF OKLAWAHA RIVER, FLORIDA.

For description, project, and results, attention is invited to the Report of the Chief of Engineers for 1896, pages 1314 to 1316, and to summary, page 284.

No work was done during the last fiscal year, and none is contemplated until the services of the U. S. dredge and snagboat *Florida* are available. This boat is now under construction and it is expected that it will be completed by October 1, 1904.

It is proposed to apply the additional appropriation recommended to completing the existing project by removing obstructions, and to maintenance of improvement.

No commercial statistics are available.

Money statement.

July 1, 1903, balance unexpended		$2,000.00
July 1, 1904, balance unexpended		2,000.00
Amount (estimated) required for completion of existing project		16,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$16,000.00	
For maintenance of improvement	3,000.00	
		19,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

Act of—		Act of—	
September 19, 1890	$10,000.00	March 3, 1899	$3,000.00
July 13, 1892	1,000.00	June 13, 1902	2,000.00
August 18, 1894	3,000.00		
June 3, 1896	3,000.00	Total	22,000.00

P 5.

IMPROVEMENT OF ST. AUGUSTINE HARBOR, FLORIDA.

For history, description, and project, see current summary, page 284, and Report of Chief of Engineers, 1896, pages 1316–1317.

No work was done during the year.

There is no commerce by water at St. Augustine.

Money statement.

July 1, 1903, balance unexpended	$279.14
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	279.14
Amount (estimated) required for completion of existing project	24,000.00

APPROPRIATIONS.

Act of—	
August 11, 1888	$35,000
September 19, 1890	20,000
July 13, 1892	10,000
August 18, 1894	6,000
Total	71,000

P 6.

IMPROVEMENT OF INDIAN RIVER, FLORIDA.

(*1*) *Indian River between Goat Creek and Jupiter Inlet.*—No work during the year. See summary, page 285, and Report of Chief of Engineers for 1896, pages 1318–1320.

It is proposed to apply the funds available and the additional appropriation recommended to completing the existing project by dredging and to maintenance of improvement.

(*2*) *Negro Cut.*—No work during the year. See summary, page 285, and Reports of Chief of Engineers for 1894, pages 1227 et seq.; for 1896, pages 1318–1319, and for 1902, pages 1210–1211.

(*3*) *Jupiter Inlet.*—No work during the year. See summary, page 286, and Reports of Chief of Engineers for 1897, page 1554, and 1901, page 1743.

Money statement.

July 1, 1903, balance unexpended		$2,000.00
Amount received for rent of U. S. dredge *Suwanee*		14.62
July 1, 1904, balance unexpended		2,014.62
Amount (estimated) required for completion of existing project		27,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$27,000.00	
For maintenance of improvement	2,000.00	
		29,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

Act of—	
July 13, 1892 (between Goat Creek and Jupiter Inlet)	$15,000.00
August 18, 1894 (Negro Cut)	5,000.00
March 2, 1895 (Negro Cut)	15,000.00
February 26, 1896 (Jupiter Inlet)	500.00
June 3, 1896 (Negro Cut)	7,500.00
March 3, 1899 (Negro Cut)	5,000.00
June 13, 1902 (between Goat Creek and Jupiter Inlet)	2,000.00
Total	50,000.00
Allotment from emergency river and harbor appropriation of June 6, 1900 (for opening Jupiter Inlet)	1,000.00
Aggregate	51,000.00
For rent of dredge	14.62
	51,014.62

P 7.

IMPROVEMENT OF BISCAYNE BAY, FLORIDA.

For description of the project and work done by the Florida East Coast Railway Company, see summary, page 286, and report and recommendations of a Board of officers published in the report of the Chief of Engineers for 1900, pages 1986–2013.

A contract was made December 17, 1903, with P. Sanford Ross (Incorporated), for dredging a channel and constructing a breakwater. Work under this contract was commenced March 15, 1904. At the end of the fiscal year 8,609.7 cubic yards of coral rock had been deposited, forming a hearting for the proposed breakwater 1,080 feet in length, with an average crest width of 20 feet at the height of about mean low water. No dredging has been done by the contractor.

Under authority of the Secretary of War dated April 8, 1904, proceedings were instituted to acquire by condemnation the land necessary in connection with this improvement.

Money statement.

July 1, 1903, balance unexpended	$299,244.90
June 30, 1904, amount expended during fiscal year, for works of improvement	10,886.89
July 1, 1904, balance unexpended	288,392.50
July 1, 1904, outstanding liabilities	13,425.58
July 1, 1904, balance available	274,966.92
July 1, 1904, amount covered by uncompleted contracts	246,445.75

APPROPRIATIONS.

Act of June 13, 1902	$50,000
Act of March 3, 1903	250,000
Total	300,000

CONTRACT IN FORCE DURING THE FISCAL YEAR.

Contractor: P. Sanford Ross, Incorporated.
Work: Dredging and construction of breakwater.
Date: December 17, 1904.
Approved: January 9, 1904.
Date of beginning: March 14, 1904.
Date of completion: March 14, 1906.

Quantities: Dredging—About 154,000 cubic yards of sand, rate 24 cents per cubic yard; 92,000 cubic yards of rock, rate $1.78 per cubic yard. Construction of breakwater—About 4,500 tons of hard rock at $5.50 per ton; about 17,000 cubic yards of coral rock at $2.50 per cubic yard.

COMMERCIAL STATISTICS.

Commerce of Biscayne Bay, Florida, during the year ending December 31, 1903.

[Furnished by Mr. C. L. Myers, general manager of the Peninsular and Occidental Steamship Company.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fruits	19	Oranges	6
Fertilizers	1,062	Ship stores	551
Grain	54	Tobacco	65
Live stock	129	Vegetables	1,710
Lumber, rough and dressed	1,375	Pineapples	1,284
Merchandise	6,994	Hides	37
Shingles	7		
Hay	2	Total	13,319
Sash, doors, and blinds	24		

Arrivals and departures of vessels for the year ending December 31, 1903.

Kind of vessel.	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steamers	163	216,142	164	217,883
Sailing vessels	9	146	8	101

Estimated number of passengers carried by water, 10,415.

P 8.

IMPROVEMENT OF HARBOR AT KEY WEST, FLORIDA, AND ENTRANCE THERETO.

For project, description, etc, see summary, page 288, and Reports of the Chief of Engineers for 1896, pages 1325–1327; for 1898, page 1371; for 1900, page 1938.

The river and harbor act of June 13, 1902, provided for a preliminary examination and survey of Key West Harbor with a view to determining the desirability and feasibility of securing a channel 30 feet in depth and 400 feet in width through the ship channel entrance into the harbor of Key West, and of said depth, and 2,500 feet in width and 1 mile in length in said harbor.

An examination was made and the locality surveyed between May 1, 1903, and October 10, 1903, and a report with estimates of the cost of the proposed work was submitted to Congress February 23, 1904.

Reference is made to House Document No. 567, Fifty-eighth Congress, second session, where the report is published in detail.

It is proposed to apply the available balance to dredging and the additional appropriation recommended to completing the existing project by dredging and extending and raising the jetties.

Money statement.

July 1, 1903, balance unexpended		$99,769.41
Sale of old material		1.50
		99,770.91
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$38.70	
For construction of dredge	80,000.00	
		80,038.70
July 1, 1904, balance unexpended		19,732.21
Amount (estimated) required for completion of existing project		100,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904		100,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.		

APPROPRIATIONS.

Act of—	
August 2, 1882	$25,000.00
August 5, 1886 (survey)	2,500.00
August 11, 1888	25,000.00
September 19, 1890	40,000.00
July 13, 1892	75,000.00
August 18, 1894	80,000.00
June 3, 1896	80,000.00
March 3, 1899	25,000.00
Allotment from emergency river and harbor act, June 6, 1900	10,000.00
Act of—	
June 13, 1902 (rivers and harbors)	$100,000.00
Total	462,500.00
Received from sales	1.50
	462,501.50

COMMERCIAL STATISTICS.

Commerce of Key West, Fla., during the year ending December 31, 1903.

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers	30	Phosphate	40,000
Fruits	266	Turpentine and rosin	2
Grain	275	Fish and oysters	505
Hides	1	Sirup, honey, etc	4
Live stock	8,000	Tobacco	554
Lumber	5,000	Cigars	1,033
Shingles	1,000	Hay	218
Sash, doors, and blinds	500	Vegetables	135
Merchandise	75,000	Sponges	250
Oranges	270		
Pineapples	1,000	Total	134,043

Arrivals and departures of vessels for the year ending December 31, 1903.

Kind of vessel.	Arrivals.		Departures.	
	Number.	Tons.	Number.	Tons.
Steamers	454	523,112	589	626,894
Sailing vessels	239	47,167	213	39,597

Estimated number of passengers carried by water, 33,564.
All traffic is by water.

P 9.

IMPROVEMENT OF KISSIMMEE RIVER, FLORIDA.

For project, description, etc., see summary, page 289, and Report of Chief of Engineers for 1903, pages 1193–1194.

The river and harbor act of June 13, 1902, appropriated $8,000 for improving Kissimmee River, Florida.

A project for expenditure of available funds was submitted July 18, 1902, and approved December 2, 1902.

At the beginning of the fiscal year dredging operations were in progress with the U. S. dredge *Kissimmee* at shoal in Southport Canal (between Lake Tohopekaliga and Cypress Lake) near the middle point of the canal. Work was continued until October 14, 1903, when available funds were exhausted.

During the fiscal year there was dredged 21,521.1 cubic yards of soft material, and 600 feet of sheet-piling bulkhead was constructed. The money expended for dredging was $1,923.73, and for bulkhead construction $344.40. These amounts include all engineering and contingent expenses. The cost of dredging per cubic yard was 8.9 cents. The cost of bulkhead construction was 57.4 cents per linear foot.

The approved project was 25 per cent accomplished on June 30, 1904.

It is proposed to apply the additional appropriation recommended to completion of the project and maintenance.

Money statement.

July 1, 1903, balance unexpended		$3,019.83
June 30, 1904, amount expended during fiscal year, for works of improvement		2,903.13
July 1, 1904, balance unexpended		116.70
July 1, 1904, outstanding liabilities		15.00
July 1, 1904, balance available		101.70
Amount (estimated) required for completion of existing project		16,220.90
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$16,220.90	
For maintenance of improvement	1,000.00	
		17,220.90
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATION.

June 13, 1902	$8,000.00

COMMERCIAL STATISTICS.

Commerce of Kissimmee River, Florida, for the year ending December 31, 1903.

[Compiled from information furnished by Capt. Clay Johnson, Kissimmee, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle	5,500	Lumber (rough and dressed)	400
Fertilizers (including phosphates)	150	Merchandise	1,500
Fish	150	Oranges	2,000
Grain	500	Vegetables	15
Hay	50	Turpentine	47
Resin	150		
Hides	130	Total	10,652
Honey, sirup, etc	60		

Number of steamboats in trade	7
Number of passengers carried in 1903	1,200

P 10.

IMPROVEMENT OF ORANGE RIVER, CHARLOTTE HARBOR, AND CALOOSAHATCHEE RIVER, FLORIDA.

These improvements were combined under one appropriation by the following item of the river and harbor act of June 13, 1902:

> Improving Orange River, Florida, in accordance with report submitted in House Document Numbered Three hundred and eighteen, Fifty-sixth Congress, first session, Charlotte Harbor and Caloosahatchee River, Florida, from Puntarasa to Punta Gorda, in accordance with the report submitted in House Document Numbered Two hundred and eighty-six, Fifty-sixth Congress, first session, nine thousand five hundred dollars, of which so much as may be necessary may be expended between Puntarasa and Fort Thompson.

On October 22, 1902, the following allotment of available funds was approved:

To Orange River	$2,000
To Charlotte Harbor and Caloosahatchee River, between Puntarasa and Punta Gorda	6,000
To Caloosahatchee River, between Puntarasa and Fort Thompson	1,500

(A) ORANGE RIVER.

See summary, page 290, and Report of the Chief of Engineers for 1900, pages 2032–2040, and for 1903, page 1195.

No work was done during the fiscal year ending June 30, 1904. Money expended was for outstanding liabilities and contingencies.

The approved project was completed June 8, 1903. It is proposed to apply the additional appropriation recommended to maintenance of the project.

Money statement.

July 1, 1903, balance unexpended	$1,065.50
June 30, 1904, amount expended during fiscal year, for works of improvement	1,065.50
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	500.00

(B) CHARLOTTE HARBOR AND CALOOSAHATCHEE RIVER, FROM PUNTARASA TO PUNTA GORDA, FLORIDA.

See summary, page 291, and Report of the Chief of Engineers for 1903, pages 2033–2036, and for 1903, pages 1195–1196.

The U. S. dredge and snag boat *Suwanee* commenced dredging operations at the shoal northeastward of Blind Pass, Pine Island Sound, on July 14, 1903, and completed channel section there August 11, 1903. Work was resumed on September 24, 1903, at the shoal northeastward of Patricio Island, where dredging had been discontinued on May 5, 1903. The channel across this shoal was completed October 10, 1903.

During the fiscal year there was dredged 16,012.6 cubic yards of soft material, at a total cost of $4,218.90, which amount includes all engineering and contingent expenses. The cost of dredging per cubic yard was 26.3 cents.

The approved project was completed October 10, 1903.

It is proposed to apply the additional appropriation recommended to maintenance of the works.

Money statement.

July 1, 1903, balance unexpended	$4,218.90
June 30, 1904, amount expended during fiscal year, for works of improvement	4,218.90
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	500.00

(c) CALOOSAHATCHEE RIVER, BETWEEN PUNTARASA AND FORT THOMPSON.

See summary, page 291, and Reports of the Chief of Engineers for 1896, pages 1327 and 1328; for 1898, page 1334, and for 1903, page 1195.

Work was in progress with the U. S. dredge and snag boat *Suwanee* at commencement of the fiscal year and continued until July 13, 1903. Work was resumed there by the dredge on August 12, 1903, and was completed on September 23, 1903.

A survey was made of channel shoals near the mouth of the river, a sunken lighter was removed from the channel at Myers, and 15,096.5 cubic yards of soft material were dredged during the fiscal year. The total cost of operations was $1,500, which amount includes all engineering and contingent expenses.

The cost of channel survey was $628.89; the cost of removing the sunken lighter was $123.32, and the cost of dredging was 5 cents per cubic yard.

The approved project was completed February 14, 1901.

It is proposed to expend the appropriation recommended for maintenance of the works.

Money statement.

July 1, 1903, balance unexpended	$1,500.00
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	3,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

Caloosahatchee River, Florida.

August 2, 1882	$5,000	August 18, 1894	$2,000
July 5, 1884	5,000	June 3, 1896	1,000
August 5, 1886	4,000	March 3, 1899	2,000
August 11, 1888	10,000		
September 19, 1890	3,600	Total appropriated	33,600
July 13, 1892	1,000	Expenditures to June 30, 1904	33,600

Charlotte Harbor and Peace Creek, Florida.

September 19, 1890	$35,000
August 18, 1894	20,000
June 3, 1896	20,000
March 3, 1899	25,000
Total appropriated	100,000
Expenditures to June 30, 1904	100,000

Orange River, Charlotte Harbor, and Caloosahatchee River, Florida.

June 13, 1902	$9,500
Expended to June 30, 1904	9,500

COMMERCIAL STATISTICS.

Commerce of Orange River for the year ending December 31, 1903.

[Compiled from information furnished by Messrs. Menge Bros., Fort Myers, Fla., and by the Fort Myers Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers	400	Oranges	2,500
Grain	200	Vegetables	75
Hay	30	Coal	1,000
Lumber (rough and dressed)	300		
Merchandise	4,050	Total	8,555

Number of steamboats in trade	5
Number of passengers carried in 1903	1,000

Commerce of Charlotte Harbor for the year ending December 31, 1903.

[Compiled from information furnished by Mr. A. F. Dewey, of Punta Gorda, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle	5,369	Honey, sirup, etc	77
Coal	6,575	Lumber (rough and dressed)	1,481
Fertilizers (including phosphates)	65,410	Merchandise	22,490
Fish	1,568	Oranges	7,494
Fruit (excluding oranges)	1,573	Vegetables	2,801
Grain	917	Oysters	20
Hay	2,175		
Hides	155	Total	118,105

Number of steamboats in trade	12
Number of sailing vessels in trade	64
Number of passengers carried in 1903	15,680

Commerce of Caloosahatchee River for the year ending December 31, 1903.

[Compiled from information furnished by Messrs. Menge Brothers, Fort Myers, and by the Fort Myers Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle	9,000	Honey, sirup, etc	14
Coal	2	Lumber (rough and dressed)	2,200
Fertilizers (including phosphates)	370	Merchandise	11,000
Fish	500	Oranges	2,250
Fruit (excluding oranges)	30	Oysters	10
Grain	800	Vegetables	900
Hay	400		
Hides	100	Total	27,576

Number of steamboats in trade	21
Number of sailing vessels in trade	23
Number of passengers carried in 1903	8,000

P II.

IMPROVEMENT OF SARASOTA BAY, FLORIDA.

For description, project, and results, see reports of Chief of Engineers for 1896, pages 1331–1332; for 1900, pages 2018–2019; for 1902, pages 1218–1219; and for 1903, page 1197.

No work has been done during the fiscal year ending June 30, 1904. The money expended was for contingent expenses.

The approved project was 35 per cent completed on June 30, 1904.

It is proposed to expend the appropriation recommended in completing the channel sections in Little Sarasota Bay, widening the sections in Sarasota Bay, and for maintenance of existing channels.

Money statement.

July 1, 1903, balance unexpended		$53.80
June 30, 1904, amount expended during fiscal year, for works of improvement		53.80
Amount (estimated) required for completion of existing project		32,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$18,000.00	
For maintenance of improvement	2,000.00	
		20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

September 19, 1890	$5,000
July 13, 1892	2,500
August 18, 1894	2,500
June 3, 1896	2,500
March 3, 1899	5,000
June 13, 1902	5,000
Total appropriated	22,500
Expended to June 30, 1904	22,500

COMMERCIAL STATISTICS.

Commerce of Sarasota Bay, Florida, for the year ending December 31, 1903.

[Compiled from information furnished by the Sarasota Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers (including phosphates)	200	Cattle	7
Fish	500	Oranges	1,500
Fruit (excluding oranges)	30	Oysters	10
Grain	500	Resin	1,200
Hay	250	Turpentine	225
Hides	20	Vegetables	135
Honey, sirup, etc	3		
Lumber (rough and dressed)	50	Total	4,755
Merchandise	125		

Number of steamboats in trade	2
Number of sailing vessels in trade	10

P 12.

IMPROVEMENT OF TAMPA BAY, FLORIDA.

For description, project, and results, see summary, page 293, and Reports of the Chief of Engineers for 1899, pages 1632–1635; for 1900, pages 2022–2025; for 1902, pages 1219–1221, and for 1903, pages 1198–1199.

At the beginning of the fiscal year dredging work was in progress under the continuing contract of August 5, 1899, with the Alabama Dredging and Jetty Company. This work continued until July 31, 1903, when operations ceased owing to financial difficulties of the contractor. The contract was terminated by supplemental agreement dated February 13, 1904.

During the fiscal year there was dredged from Tampa Bay 8,460.1 cubic yards of soft material. The contract price was 11.99 cents per yard.

The approved project was 49 per cent completed on June 30, 1904.

It is proposed to apply the available balance to widening and deepening the partially completed channel section.

Money statement.

July 1, 1903, balance unexpended	$356, 318. 58
June 30, 1904, amount expended during fiscal year, for works of improvement	[a]78, 687. 57
July 1, 1904, balance unexpended	277, 631. 01
July 1, 1904, outstanding liabilities	1, 480. 04
July 1, 1904, balance available	276, 150. 97
Amount (estimated) required for completion of existing project	139, 987. 24

APPROPRIATIONS.

Under previous projects.

By act of—	
June 14, 1880	$10, 000. 00
March 3, 1881	10, 000. 00
August 2, 1882	20, 000. 00
July 5, 1884	20, 000. 00
August 5, 1886	10, 000. 00
August 11, 1888	25, 000. 00
September 19, 1890	25, 000. 00
July 13, 1892	10, 000. 00
Total appropriation for previous projects	130, 000. 00
Expended:	
On channel from Tampa through Hillsboro River and Bay	80, 000. 00
In dredging bars at entrance of old Tampa Bay	50, 000. 00
Expended on previous projects	130, 000. 00

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[a] Includes $15,000 allotted for construction of Key West dredge.

Under present project.

By act of—

March 3, 1899	$75,000.00
June 6, 1900	135,000.00
March 3, 1901	127,000.00
June 28, 1902	86,675.00
March 3, 1903	186,337.76
Total	610,012.76

CONTRACT IN FORCE DURING THE FISCAL YEAR.

Contractor: Alabama Dredging and Jetty Company.

Work: Dredging in Tampa Bay and on the bar at the entrance to Tampa Bay, Florida.

Date: August 5, 1899.

Approved: September 22, 1899.

Date of beginning: August 3, 1899.

Date of completion: Continuing contract.

Quantities: On the bar, 450,000 cubic yards, more or less, at 15 cents per cubic yard; in the bay, 3,700,000 cubic yards, more or less, at 11.99 cents per cubic yard.

COMMERCIAL STATISTICS.

Commerce of Tampa Bay, Florida, for the year ending December 31, 1903.

[Compiled from information furnished by the Atlantic Land and Improvement Company.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Tobacco	1,969	Merchandise	5,506
Cattle	3	Oranges	117
Coal	9,911	Resin	2,559
Fertilizers (including phosphates)	382,348	Turpentine	337
Fish	168	Vegetables	288
Fruit (excluding oranges)	238	Oil (fuel)	18,946
Grain	141	Crate material and manufactured lumber	6,066
Fuller's earth	26		
Wines and liquors	95		
Lumber (rough and dressed)	7,149	Total	435,867

Number of steamboats cleared	269
Number of steamships and sailing vessels cleared	84
Number of passengers carried in 1903	15,780

P 13.

IMPROVEMENT OF HILLSBORO BAY, FLORIDA.

For description, projects, and results, see summary, page 294, and Reports of the Chief of Engineers for 1899, pages 1635–1637; for 1900, pages 2025–2027; for 1902, pages 1222–1223, and for 1903, pages 1200–1201.

For preliminary examination and survey of "Hillsboro Bay, with a view to determining such extension and increase of channel depth as will accommodate present and prospective commerce, with turning basin," see House Document No. 306, Fifty-eighth Congress, second session.

At the beginning of the fiscal year work of dredging was in progress under the contract with Mr. Edwin W. Preston, dated October 13, 1902. This work continued until November 5, 1903, when it ceased, owing to financial difficulties of the contractor. The contract was annulled on May 7, 1904.

Specifications were prepared for completion of the project, and the work was readvertised June 20, 1904.

There was removed during the fiscal year 82,511.1 cubic yards of soft material and 1,020.55 cubic yards of rock. The contract price for dredging soft material was 18¾ cents per cubic yard, and for the removal of rock $4.89 per cubic yard.

The project was 87 per cent completed on June 30, 1904.

It is proposed to expend the appropriation recommended in completing the approved project, if the available funds are insufficient under the new contract, and for maintenance of the works.

In June, 1904, two sunken pontons and a dredge ladder were removed from the channel in Hillsboro Bay. These had been abandoned by the contractor and were dangerous obstructions.

Money statement.

July 1, 1903, balance unexpended	$61,390.46
June 30, 1904, amount expended during fiscal year, for works of improvement	32,802.66
July 1, 1904, balance unexpended	28,587.80
July 1, 1904, outstanding liabilities	100.00
July 1, 1904, balance available	28,487.80
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	2,000.00

APPROPRIATIONS.

A list of appropriations made for previous projects in this locality is given in the report for the improvement of Tampa Bay in the Annual Report of the Chief of Engineers for 1899, page 1634.

Under present project, by act of March 3, 1899	$125,000.00
Under present project, by act of June 13, 1902	150,000.00
	275,000.00
Total expended	246,412.20
Balance unexpended June 30, 1904	28,587.80

CONTRACT IN FORCE DURING THE FISCAL YEAR.

Contractor: Edwin W. Preston, Tampa, Fla.
Work: Dredging and removal of rock, Hillsboro Bay and River, Florida.
Date: October 13, 1902.
Approved: November 15, 1902.
Date of beginning: October 7, 1902.
Date of completion: September 19, 1903.
Quantities: 18,000 cubic yards, more or less, at $4.89 per cubic yard; 370,000 cubic yards, more or less, at 18¾ cents per cubic yard.

COMMERCIAL STATISTICS.

Commerce of Hillsboro Bay, Florida, for the year ending December 31, 1903.

[Compiled from information furnished by the Tampa Board of Trade.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Brick	4,250	Naval stores	6,820
Building materials	1,726	Oranges	12,100
Canned goods	5,175	Other fruits	2,390
Cattle	3,130	Oysters	460
Coal	16,400	Shingles	3,750
Fertilizers	15,600	Sidewalk material	18,940
Crate materials	1,150	Soap, starch, etc	3,980
Fish	5,290	Sugar	1,965
Fullers earth	9,300	Timber	8,750
Grain	47,228	Tropical fruits (in bulk)	2,175
Hay	7,260	Vegetables	9,600
Hides	258	Wood and boiler fuel	8,150
Honey, sirup, etc	105		
Lumber (rough and dressed)	13,700	Total	227,652
Merchandise not specified	18,000		

Number of steamboats in trade	14
Number of sailing vessels in trade [a]	37
Number of passengers carried in 1903	21,400

P 14.

IMPROVEMENT OF CRYSTAL, MANATEE, ANCLOTE, SUWANEE, AND WITHLACOOCHEE RIVERS, FLORIDA.

These improvements were consolidated by the following item of the act of June 13, 1902:

> Improving Crystal, Manatee, Anclote, Suwanee, and Withlacoochee rivers, Florida: Continuing improvement and for maintenance, thirty-five thousand dollars, and the further sum of fifteen thousand dollars, to be used in deepening the channel from the mouth of the Withlacoochee River to the loading pool in the Gulf of Mexico, being a distance of eleven thousand seven hundred and eighty feet, to the depth of eight feet, and to straighten said channel where the same is crooked, and for the maintenance of said channel.

On October 18, 1902, the following allotment of funds was approved:

Crystal River	$10,000
Anclote River	10,000
Manatee River	2,342
Suwanee River	7,658
Withlacoochee River (old project)	5,000

There was also available a balance of $420.85 from a former appropriation for improving the Withlacoochee River. This sum was reallotted to the improvement of Withlacoochee River (old project), making the total allotment for that work $5,420.85.

(A) CRYSTAL RIVER.

For description, project, and survey report, see summary, page 295, and Report of Chief of Engineers for 1900, pages 2075–2078.

A project for expenditure of available funds was approved October 18, 1902.

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[a] Does not include fishing schooners or sharpies.

The U. S. dredge and snag boat *Suwanee* on November 13, 1903, commenced the work of improvement and continued operations until March 15, 1904, when funds were exhausted. During the fiscal year there was dredged 41,658.9 cubic yards of soft material and 244.1 cubic yards of rock. The total cost of the work was $7,300, including all engineering and contingent expenses. The cost of dredging soft material was $6,705.73, and removing rock $594.27.

The cost of dredging soft material was 16.1 cents per cubic yard, and of removing rock $2.43 per cubic yard.

The project was 15 per cent completed on June 30, 1904.

It is proposed to expend the appropriation recommended in continuing the work of improvement.

Money statement.

July 1, 1903, balance unexpended	$8,746.17
June 30, 1904, amount expended during fiscal year, for works of improvement	6,853.68
July 1, 1904, balance unexpended	1,892.49
July 1, 1904, outstanding liabilities	[a] 1,892.49
Amount (estimated) required for completion of existing project	74,647.46
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

(B) MANATEE RIVER.

For description, projects, and results, see summary, page 296, and Reports of Chief of Engineers for 1896, pages 1332–1333; for 1900, pages 2020–2021; for 1902, page 1223, and for 1903, page 1203.

No work was done during the fiscal year ending June 30, 1904.

The money expended was for contingent expenses.

At the end of the fiscal year the project was 75 per cent completed.

It is proposed to apply the appropriation recommended to continuing work under the existing project by dredging, and to maintenance.

Money statement.

July 1, 1903, balance unexpended		$40.84
June 30, 1904, amount expended during fiscal year		40.84
Amount (estimated) required for completion of existing project		27,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$20,000.00	
For maintenance of improvement	2,500.00	
		22,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

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[a] Balance of allotment of $2,700 for construction of dredge *Florida*.

(C) ANCLOTE RIVER.

For description, project, and results, see summary, page 297, and Reports of Chief of Engineers for 1895, pages 1573–1576; for 1898, pages 1361–1363; for 1900, pages 2028–2029; for 1902, page 1223, and for 1903, page 1203.

The project, approved October 24, 1902, for expenditure of available funds, was modified May 31, 1904, providing for expenditure of balance of available funds in dredging between Sponge Harbor and the county bridge at Tarpon Springs.

The U. S. dredge and snag boat *Suwanee* commenced dredging March 21, 1904, and at end of the fiscal year had removed 43,698.5 cubic yards of soft material, and 203.3 cubic yards of rock. The total cost of the work was $6,589.48, which amount includes all engineering and contingent expenses. The cost of dredging soft material was 14 cents per yard, and removing rock $2.23 per yard.

The approved project was 34 per cent completed on June 30, 1904.

It is proposed to expend the appropriation recommended in continuing the improvement by widening the channel sections between Anclote Anchorage and the county bridge at Tarpon Springs.

Money statement.

July 1, 1903, balance unexpended	$8,801.85
June 30, 1904, amount expended during fiscal year, for works of improvement	4,391.33
July 1, 1904, balance unexpended	4,410.52
July 1, 1904, outstanding liabilities	[a]3,698.51
July 1, 1904, balance available	712.01
Amount (estimated) required for completion of existing project	36,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904, for works of improvement	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

(D) SUWANEE RIVER.

For description, project, and results, see summary, page 297, and Reports of the Chief of Engineers for 1896, pages 1335–1336; for 1898, pages 1341–1342; for 1902, pages 1223–1224, and for 1903, page 1203.

No work was done during the fiscal year ending June 30, 1904.

The money expended was for contingent expenses, the principal item being repairs to the U. S. dredge and snag boat *Suwanee.*

The project was 86 per cent completed on June 30, 1904.

It is proposed to apply the appropriation recommended to completing the project by dredging, rock removal, and building wing-dams, and to maintenance of improvement.

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[a] Includes $2,700 allotted for construction of dredge *Florida.*

Money statement.

July 1, 1903, balance unexpended		$6,844.95
Amount received for rent of U. S. dredge *Suwanee*		78.90
		6,923.85
June 30, 1904, amount expended during fiscal year, for works of improvement		560.05
July 1, 1904, balance unexpended		6,363.80
July 1, 1904, outstanding liabilities		2,100.00
July 1, 1904, balance available		4,263.80
Amount (estimated) required for completion of existing project		2,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$2,500.00	
For maintenance of improvement	1,500.00	
		4,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

(E) WITHLACOOCHEE RIVER.

For description, survey, projects, and results, see summary, page 298, and Reports of the Chief of Engineers for 1898, pages 1340–1341 and 1363–1369; for 1902, page 1224, and for 1903, page 1203.

No work was done and no money expended under the old project during the fiscal year ended June 30, 1904.

Specifications were prepared for operations under the new project, and the work was advertised on June 15, 1904.

The money expended was for contingencies.

No work on the actual improvement had been done up to June 30, 1904.

It is proposed to apply the available balance to completing the existing project by dredging and rock removal.

Money statements.

OLD PROJECT.

July 1, 1903, balance unexpended	$5,296.38
July 1, 1904, balance unexpended	5,296.38
July 1, 1904, outstanding liabilities	[a]5,296.38

NEW PROJECT.

July 1, 1903, balance unexpended	$14,500.68
June 30, 1904, amount expended during fiscal year for works of improvement	.68
July 1, 1904, balance unexpended	14,500.00

APPROPRIATIONS.

Manatee River.

August 2, 1882	$12,000	August 18, 1894	$3,000
August 5, 1886	11,000	June 3, 1896	[b]4,000
August 11, 1888	5,000	March 3, 1899	[c]10,000
September 19, 1890	6,000		
July 13, 1892	6,000	Total	57,000

[a] Amount allotted for construction of dredge *Florida*.

[b] Includes $3,000 for Terraceia Cut-off.

[c] Includes $8,000 for Terraceia Cut-off.

Anclote River.

March 3, 1899	$5,000

Withlacoochee River.

March 3, 1881	$7,500	August 18, 1894	$800
July 5, 1884	3,000	June 13, 1902	15,000
August 5, 1886	3,000		
August 11, 1888	5,000	Total	39,700
September 19, 1890	5,400		

Suwanee River.

June 14, 1880	$5,000.00	July 13, 1892	$3,000.00
March 3, 1881	3,000.00	August 18, 1894	3,000.00
August 2, 1882	5,000.00	June 3, 1896	3,000.00
July 5, 1884	5,000.00	March 3, 1899	5,000.00
August 5, 1886	5,000.00	For rent of dredge	78.90
August 11, 1888	15,000.00		
September 19, 1890	3,000.00	Total	55,078.90

Crystal, Manatee, Anclote, Suwanee, and Withlacoochee rivers.

June 13, 1902	$35,000

COMMERCIAL STATISTICS.

Commerce of Crystal River for the year ending December 31, 1903.

[Compiled from information furnished by Mr. C. E. Herrick, Crystal River, Fla.]

Articles.	Gross tonnage.
Fish	50
Lumber (rough and dressed)	600
Oysters	50
Merchandise	25
Total	725

Number of steamboats in trade	1
Number of sailing vessels in trade	1
Number of passengers carried in 1903	150

Commerce of Manatee River for the year ending December 31, 1903.

[Compiled from information furnished by the Independent Line Steamers, Tampa, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Cattle	1,650	Turpentine	262
Coal	350	Vegetables	3,750
Fullers earth	10,000	Hides	30
Merchandise	5,450	Lumber	1,500
Oranges	7,500	Hay	750
Fertilizers	7,000		
Grain	5,500	Total	44,367
Resin	625		

Commerce of Anclote River for the year ending December 31, 1903.

[Compiled from information furnished by Mr. John K. Cheyney, Tarpon Springs, Fla.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Fertilizers (including phosphates)	20	Shingles	503
Lumber (rough and dressed)	1,125	Shells (paving)	100
Oranges	60	Sponges	[a]110
Oysters	40		
Turpentine	180	Total	2,138

[a] This item was valued at $345,000.

Number of small power boats and launches	26
Number of steamboats in trade	1
Number of sailing vessels in trade	220
Number of passengers carried in 1903	700

Commerce of Withlacoochee River for the year ending December 31, 1903.

[Compiled from information furnished by Mr. John L. Inglis, president of the Dunnellon Phosphate Company.]

Articles.	Gross tonnage.	Articles.	Gross tonnage.
Coal	942	Oysters	18
Grain	12	Wood	4,626
Fertilizers (including phosphates)	109,499	Hay	54
Fish	21		
Lumber (rough and dressed)	45	Total	115,269
Merchandise	52		

Number of steamboats in trade	3
Number of passengers carried in 1903	1,080

NOTE.—Statistics for Suwanee River could not be obtained.

P 15.

REMOVING THE WATER HYACINTH FROM FLORIDA WATERS.

For original condition, project, etc., see current summary, page 299, Report of the Chief of Engineers for 1899, pages 1612–1623; for 1901, pages 1746–1749; and for 1903, pages 1184–1186.

The following is a summary of operations on the St. Johns River and its tributaries during the fiscal year ending June 30, 1904:

Date.	Locality.	Number of gallons of Harvesta chemical compound used.	Number of square yards of hyacinths destroyed.
1903.			
July	Peters Creek	41,099	494,000
August	Palatka and vicinity	240,833	2,890,000
September	Black Creek and Peters Creek	156,667	1,879,982
	Palatka	11,667	140,004
October	Palatka and vicinity	230,833	2,769,996
November	do	5,000	60,000
December	do	190,000	2,280,000
1904.			
January	do	60,000	720,000
	Total	936,099	11,233,982

Since the commencement of this work in November, 1902, a total of 1,178,602 gallons of the compound has been used, covering and destroying 14,144,018 square yards of the water hyacinth. This work has resulted in relieving the congestion of traffic caused by accumulation of the hyacinth plant. Since the substitution of bicarbonate of soda for saltpeter in the spraying compound there have been fewer complaints from cattlemen of injury to stock, and none in which it has been clearly shown that the injury could be traced to the compound.

Spraying operations ceased January 10, 1904, owing to exhaustion of funds, and the steamer *Le Rêve* was laid up at Jacksonville.

Money statement.

July 1, 1903, balance unexpended	$37, 380. 43
Amount allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904	25, 000. 00
	62, 380. 43
June 30, 1904, amount expended during fiscal year, for works of improvement	35, 347. 78
July 1, 1904, balance unexpended	27, 032. 65
July 1, 1904, outstanding liabilities	50. 00
July 1, 1904, balance available	26, 982. 65
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	125, 000. 00

APPROPRIATIONS.

Act of March 3, 1899:	
For construction of boat	$25, 000
For log booms	1, 000
For operating expenses	10, 000
Act of June 13, 1902:	
For removal of the water hyacinth from the navigable waters of the States of Florida, Texas, and Louisiana, $50,000; alloted for Florida	25, 000
Emergency river and harbor act of April 28, 1904	25, 000
Total	86, 000

P 16.

DREDGE FOR RIVER AND HARBOR IMPROVEMENTS, FLORIDA.

See Report of the Chief of Engineers for 1901, pages 1749–1750. A contract with the Merrill-Stevens Engineering Company for the construction of the boat was approved July 11, 1903. Work began without delay and the hull was launched April 2, 1904. At the end of the fiscal year the A frame and gallows frame were in position, the upper works in course of construction, and the machinery being installed. The carrier frame, which is not included in the contract, was 80 per cent completed. Part of the hydraulic dredging plant had been installed at a cost of $1,142.79.

Money statement.

July 1, 1903, balance unexpended	$65, 785. 43
June 30, 1904, amount expendeddu ring fiscal year, for works of improvement	14, 055. 90
July 1, 1904, balance unexpended	51, 729. 53
July 1, 1904, outstanding liabilities	232. 70
July 1, 1904, balance available	51, 496. 83
July 1, 1904, amount covered by uncompleted contracts	49, 123. 75

APPROPRIATIONS.

Act of March 3, 1899	$35, 000
Act of June 13, 1902	35, 000
Total	70, 000

CONTRACT IN FORCE DURING THE FISCAL YEAR.

Contractor: Merrill-Stevens Engineering Company.
Work: Construction of combined dredge and snag boat.
Date: May 20, 1903.
Approved: July 11, 1903.
Date of beginning: September 16, 1903.
Date of completion: September 16, 1904.
Amount: $61,404.50.

P 17.

PRELIMINARY EXAMINATION OF CHARLOTTE HARBOR, FLORIDA.

[Printed in House Doc. No. 181, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith for transmission to Congress copy of a report dated September 18, 1902, by Capt. Herbert Deakyne, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved June 13, 1902, of Charlotte Harbor, Florida, "with a view to extending the 12-foot channel to the railroad wharf at Punta Gorda and along the dock line in front of said town."

Under a project begun in 1890 a channel of navigable width and 12 feet deep at mean low water has been secured from the entrance of Charlotte Harbor to the town of Punta Gorda, and the object of this examination is to ascertain the advisability of extending this improvement as indicated in the item of the act quoted. In the opinion of Captain Deakyne the harbor is worthy of further improvement to the extent specified in the act.

In forwarding the report to this office the division engineer, Col. Peter C. Hains, Corps of Engineers (now brigadier-general, U. S. Army), stated that in his judgment the harbor was worthy of improvement to a certain extent and recommended that a survey of the locality be made to ascertain whether the cost of improvement would justify its being undertaken.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of said act, and attention is respectfully invited to the Board's report of March 11, 1903, in third indorsement thereon.

As a result of its investigation, and after a personal inspection of the locality by a committee, the Board states that it is forced to the conclusion that it is not advisable that the United States should begin the improvement contemplated by the act.

I concur in the views of the Board.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. HERBERT DEAKYNE, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Tampa, Fla., September 18, 1902.

GENERAL: I have the honor to submit the following report on a preliminary examination of "Charlotte Harbor, with a view to extending the 12-foot channel to the railroad wharf at Punta Gorda, and along the dock line in front of said town," made in accordance with the river and harbor act approved June 13, 1902.

The examination was made on August 28 and 29, 1902, by Mr. W. H. Caldwell, assistant engineer, and attention is respectfully invited to his report hereto appended:

Charlotte Harbor is on the west coast of Florida between 26° and 27° north latitude. It communicates with the Gulf of Mexico through Boca Grande, a pass lying between Gasparilla and La Costa islands. The width of the pass is 3,000 feet, and its depth from 30 to 60 feet at mean low water. Outside the pass is a bar on which the depth is 19 feet. From the entrance the harbor extends easterly for about 10 miles, thence it extends northerly about 12 miles to its head, where it is entered by Peace and Myacca rivers. The harbor has a very uniform width of 5 to 6 miles.

The principal settlement on the harbor is the town of Punta Gorda, on the south bank of Peace River, close to its mouth. Before improvement the channel from Boca Grande to Punta Gorda had a navigable depth of 9 feet at mean low water. Improvement was begun about twelve years ago. Congress appropriated $35,000 on September 19, 1890, for "improving, dredging, and deepening the channel of Charlotte Harbor and Peace Creek, Florida, to the pier at Punta Gorda, the terminus of the Florida Southern Railroad." With the money thus appropriated work was begun on a project for a channel 12 feet deep at mean low water from the entrance to Punta Gorda, with a width as great as funds would permit. Work was prosecuted under this project until December, 1899, resulting in a channel 12 feet deep at mean low water and 200 feet wide, except near the wharves at Punta Gorda, where the width was 120 feet. At the end of the wharf in Punta Gorda, known as "Long Dock," the width was made 300 feet, for a length of 300 feet, to form a turning basin.

The channel extends from Long Dock eastward for more than a mile to a point nearly opposite, and 1,965 feet distant from the dock of the Atlantic Coast Line Railroad. Between this dock and Long Dock there are two other wharves, Sandlyn's dock and another for loading cattle. Another wharf is being built in this part of the harbor by the owners of a large ice, fertilizer, and fish-handling plant, now being erected.

When the improvement of the harbor was undertaken all the business of Punta Gorda was done at the Long Dock, but after the construction of the railroad wharf, the business was transferred there, and Long Dock has been allowed to go to ruin. The maintenance of wharves of considerable length in Charlotte Harbor is very expensive, on account of the activity of the teredo in that section.

The commerce of Charlotte Harbor has increased rapidly since 1890, when it was 18,849 tons. In 1900 it was estimated at 85,475 tons, and there is a prospect of a considerable increase over this latter figure in the near future. The greatest item is the phosphate shipment. The phosphate plant at Liverpool, on Peace River, was recently burned, but is being rebuilt with a capacity of 10,000 tons per month. The other items of importance are fish, fruit, vegetables, and cattle. A large plant for handling fish is near completion at Punta Gorda. The shipment of its product by water is expected to amount to 20,000 tons per year.

The improvement desired is the extension of the existing 12-foot channel to the railroad wharf and along the dock line in front of the town. The channel is now from 2,700 to 4,400 feet from shore. The wharves now available for use are the railroad wharves, Sandlyn's dock, the cattle dock, and the new wharf just being completed. These wharves are from 500 feet to 1,400 feet or more in length, and extend only to shallow water, probably 6 feet or less. Vessels of greater draft than 6 feet must lie at anchor below the town and receive their cargoes from lighters or small boats. In order to reach the channel, the existing wharves would require extensions varying in length from 1,400 to 4,000 feet. The additional cost of maintenance is a very serious factor in the problem for the owners of the wharves.

The extension of the channel to the wharves appears to be entirely in accord with the original project. The wharf that was used when that project was adopted is now in disuse and other wharves have taken its place.

In my opinion Charlotte Harbor is worthy of improvement to the extent specified in the act of June 13, 1902.

In order to make an estimate of the cost of the improvement, it will be necessary to do a small amount of surveying, at a cost of about $350.

Very respectfully, your obedient servant,

HERBERT DEAKYNE,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., September 20, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

Owing to the records on file in the office at Tampa, it will require only $350 to make a survey and an estimate of the cost of the proposed improvement. In my judgment the harbor is worthy of improvement to a certain extent, and I recommend that the survey be made to ascertain whether the cost of improvement will justify the United States in undertaking it.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 23, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer, the indorsement of the division engineer thereon, and has through a committee made a personal inspection of the locality.

A channel as contemplated in the act of June 13, 1902, and as desired by interested persons, would not follow the line of present deepest water. A part of such channel would lie across the flow of the natural currents and would speedily be obliterated. The question appears to be whether wharves shall be built out to the natural channel or whether a channel shall be frequently dredged to and along a wharf line close to the shore. A careful consideration of the circumstances above stated, and of the commerce of the port, forces upon the Board the conclusion that it is not advisable that the United States should begin this improvement.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. W. H. CALDWELL, ASSISTANT ENGINEER.

United States Engineer Office,
Tampa, Fla., September 8, 1902.

Captain: I have the honor to submit the following report on a preliminary examination of "Charlotte Harbor, with a view to extending the 12-foot channel to the railroad wharf at Punta Gorda and along the dock line in front of said town," made on August 28 and 29, 1902, in accordance with your instructions.

The 12-foot dredged channel ends in midstream nearly opposite the terminal wharf of the Atlantic Coast Line Railroad. From that point the inner channel section runs 5,680 feet south 68° 43′ west, true, to the turning basin dredged in 1893 at end of Long Dock. The southern edge of this channel is distant from the shore line in front of Punta Gorda a distance varying from 2,700 to 4,400 feet. The upper end of the channel is 1,965 feet from the railroad wharf and 1,415 feet from Sandlyn's dock. A new dock for loading cattle, eastward of old Long Dock, has recently been built. The water is shoal in front of the town, the 6-foot contour being about halfway between the shore line and the dredged channel section.

The improvement desired is an extension of the 12-foot channel to the railroad wharf and along the dock line in front of the town. This extension is needed, for steamers already running to Punta Gorda get aground near the wharves, and other vessels would call there if there was an available channel depth of 12 feet to the wharves.

The commerce of Charlotte Harbor has increased rapidly since 1890, due principally to the development of phosphate mines along Peace River. It consists of receipts and shipments of phosphate rock, cattle, hay, grain, fruits, vegetables, lumber, fish, and general merchandise. The total commerce handled by water in 1890 was 18,849 tons and 85,475 tons in 1900. A detailed statement of the commercial statistics for the year ending July 1, 1902, is given below:

	Tons.
Cattle	2,736
Phosphate rock	25,678
Coal	800
Lumber	1,650
Hay	407
Grain	1,416
Vegetables	3,500
Oranges	3,200
Grape fruit and pineapples	267
Fish	11,018
General merchandise	9,815
Total	60,487

In the above total is included the cattle shipped from Myacca River dock as well as the Punta Gorda dock, for both of them are on Charlotte Harbor. The phosphate shipments are for six months only, the grinding plant at Liverpool having been destroyed by fire at the end of that time. A new and larger plant is just being finished at Liverpool, on Peace River, 11 miles above Punta Gorda, and shipments will be resumed on the 15th of this month. It is expected that future shipments will approximate 10,000 tons per month.

A big plant for shipping fresh fish, manufacturing fertilizer and glue is nearing completion at Punta Gorda. They have an ice and cold-storage plant already completed that will manufacture 100 tons of ice per day. It was stated to me that the plant would be in operation within ninety days, and that its shipments by water would aggregate 20,000 tons per year.

Complete maps of Charlotte Harbor, from the United States Engineer's survey of 1890–91, are on file in this office. It will be necessary to locate the present docks and to recheck the depths between the dock line and the dredged channel before preparing a plan or estimates of the improvement. Such a survey will cost about $350.

Very respectfully,

W. H. Caldwell,
Assistant Engineer.

Capt. Herbert Deakyne,
Corps of Engineers.

P 18.

PRELIMINARY EXAMINATION OF ESTERO CREEK OR RIVER, FLORIDA.

[Printed in House Doc. No. 175, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 4, 1903.

Sir: I have the honor to submit herewith report dated September 12, 1902, by Capt. Herbert Deakyne, Corps of Engineers, on preliminary examination of Estero River, Florida, ordered by the river and harbor act approved June 13, 1902. In Captain Deakyne's opinion, concurred in by the division engineer, Col. Peter C. Hains, Corps of Engineers (now brigadier-general, U. S. Army), the locality is not worthy of improvement by the General Government.

This report has been reviewed by the Board of Engineers for Rivers and Harbors, pursuant to the provisions of sections 3 and 14 of the above-mentioned act, and the Board concludes in its report of January 3, 1903, that it is not desirable that the United States should commence this improvement.

I concur in the views of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. HERBERT DEAKYNE, CORPS OF ENGINEERS.

United States Engineer Office,
Tampa, Fla., September 12, 1902.

General: I have the honor to submit the following report of a preliminary examination of Estero River, made in accordance with the provisions of the river and harbor act approved June 13, 1902.

The examination was made on August 25, 1902, by Mr. W. H. Caldwell, assistant engineer, and attention is respectfully invited to his report appended hereto.

The stream in question, which is locally known as Estero Creek, is situated on the west coast of Florida, a few miles south of the Caloosahatchee River. It has a length of about 11½ miles and empties into Estero Bay, which is a northerly extension of Ostego Bay, lying between Estero Island and the mainland.

The principal productions of the territory adjacent to the stream are fruit and vegetables, of which a total of 670 tons was exported during the year ending July 1, 1902. The imports into the region during that time were estimated at 330 tons, consisting of building material, fertilizer, general merchandise, grain, and hay. Mr. Caldwell states that less than half of this total commerce of 1,000 tons was carried by the creek.

The channel of the creek has a depth varying from 3 to 15 feet except at the mouth, where it is obstructed by a sand bar, and for a mile above the mouth, where there are numerous oyster bars and mud banks. At mean low water the creek can not be entered by boats drawing more than a few inches. The mean range of tide is about 1.8 feet. The stream is narrow and crooked. The width is about 100 feet at the mouth, 45 feet at Estero post-office, some 5 or 6 miles above the mouth, and only a few feet at the headwaters. There is a pile highway bridge at the post-office.

The improvement desired appears to be a channel 30 feet wide and 3 feet deep at mean low water. To secure such a channel it would be necessary to dredge the shoals and probably to construct jetties across the sand bar at the entrance. The commerce affected is not sufficient to warrant the expenditure of the money required for the improvement.

In my opinion Estero River is not worthy of improvement.

Very respectfully, your obedient servant,

HERBERT DEAKYNE,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., September 15, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

I concur in the opinion expressed by the district engineer.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 18, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 3, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Captain Deakyne on the preliminary examination of Estero River, Florida, the indorsement of the division engineer upon the same, and the written statements of interested parties.

The mouth of the Estero River is but a few inches deep at mean low tide, and its width is but 45 feet at Estero post-office, some 5 or 6 miles above the mouth. The region along the river has a total in and out bound commerce stated to be 1,000 tons per annum.

It is doubtless true that an improvement of the stream would afford a transportation route of value to this small community. But when consideration is given to the enormous sums which would be required to improve all waterways throughout the United States which fall in the class with Estero River, both as to character of stream and extent and nature of commerce affected, the Board is compelled to believe that it is not desirable that the United States should commence this improvement.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. W. H. CALDWELL, ASSISTANT ENGINEER.

United States Engineer Office,
Tampa, Fla., September 3, 1902.

Captain: I have the honor to submit the following report upon a preliminary examination of Estero River, Florida, made August 25, 1902, in accordance with your instructions:

Estero River, or Creek, is in Lee County, on the west coast of Florida, and has a total length of about 11½ miles. The creek is formed by three small branches that flow from cypress swamps. One of these branches flowing southeasterly and another northwesterly unite about 10 miles from the mouth of the river. The third branch also flows northwesterly and unites with the water from the other two branches about 9½ miles above the creek's mouth. The confluence of the three branches forms what is locally known as Estero Creek. The creek flows westerly and empties into Estero Bay. Mulock Creek and Hendrys Creek also empty into the bay near the same point as Estero Creek; the three creeks form an estuary about 2 miles long and 1 mile wide. Estero Bay is the northerly extension of Ostego Bay, and is situated between Estero Island and the mainland. The mouth of Estero Creek is about 11 miles from Sanibel Island light-house and 43 miles from Cape Romano. The creek is a narrow and crooked stream, about 100 feet wide at its mouth, 45 feet wide at Estero post-office, and only a few feet in width at its headwaters. A pile bridge on the Myers and Naples public road crosses the creek at Estero post-office.

Entrance to the river is obstructed by a long sand bar, which shifts from season to season, and over which there is only a few inches of water at mean low tide. The average rise of high tide above the plane of mean low water is about 1.8 feet. At the mouth of the creek and extending upstream for a mile or more are numerous oyster bars and mud banks that obstruct the channel. The remainder of the river has a depth varying from 3 to 15 feet, and though the channel is crooked it is unobstructed save by a few snags.

The only craft attempting to navigate the stream are a steam launch and a barge driven by a gasoline engine.

There is little commerce on the creek, for the total population in its vicinity is less than 500 people. There is a small store at Estero post-office. There is a large orange grove (185 acres) 9 miles above the mouth of the creek that was planted last season. There are good fruit and vegetable lands along the creek that might be developed were transportation facilities better. Major portion of the supplies for the section are hauled by wagon, either from Myers, 16 miles, or from a landing on Ostego Bay, 4 miles.

Following are the commercial statistics of the Estero Creek region for the year ending July 1, 1902:

Imports.	Tons.
General merchandise	25
Grain	18
Hay	7
Fertilizer	100
Lumber	150
Shingles	30
Total	330

Exports.	Tons.
Oranges	10
Vegetables	300
Melons	360
Total	670

The sum of the imports and exports equals 1,000 tons. Less than one-half this amount was transported on Estero Creek.

Those interested in the improvement of the stream do not agree as to what is most needed. The concensus of opinion is that an available channel 3 feet deep at mean low water and 30 feet wide would answer all needs. It does not appear, however, that the present condition of commerce would warrant the necessary expenditures for the improvement. In my opinion the channel through the bar could not be permanently deepened without a system of jetty construction.

The present commercial traffic is so small that I do not believe Estero River is now worthy of improvement, and therefore recommend that no survey of the stream be made.

Very respectfully,

W. H. Caldwell,
Assistant Engineer.

Capt. Herbert Deakyne,
Corps of Engineers.

P 19.

PRELIMINARY EXAMINATION OF GASPARILLA SOUND AND LEMON BAY, FLORIDA, INCLUDING CUT-OFF.

[Printed in House Doc. No. 191, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 7, 1903.

Sir: I have the honor to submit herewith a report, dated September 16, 1902, by Capt. Herbert Deakyne, Corps of Engineers, on preliminary examination of Gasparilla Sound and Lemon Bay, Florida, including cut-off, ordered by the river and harbor act approved June 13, 1902.

The views of the district officer and the division engineer are summarized in report of February 19, 1903, by the Board of Engineers for Rivers and Harbors, which has reviewed this report under the provisions of sections 3 and 14 of the above-mentioned act, and the Board expresses the opinion that it is not advisable for the United States to undertake this improvement.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. HERBERT DEAKYNE, CORPS OF ENGINEERS.

United States Engineer Office,
Tampa, Fla., September 16, 1902.

General: I have the honor to submit the following report of a preliminary examination of Gasparilla Sound and Lemon Bay, including cut-off, made in accordance with the river and harbor act approved June 13, 1902.

The examination was made August 26 and 27, 1902, by Mr. W. H. Caldwell, assistant engineer, to whose report, hereto appended, attention is respectfully invited.

Under the provisions of the river and harbor act approved March 3, 1899, a preliminary examination and survey were made of inside passage through Sarasota Bay to Lemon Bay. It was found that no inside passage existed, but a survey of Lemon Bay was made. A report of the survey was made by Capt. Henry Jervey, Corps of Engineers, January 18, 1900. The expense of improving Lemon Bay was too great in proportion to the commerce to be benefited, and the locality was reported as not worthy of improvement.

Gasparilla Sound and Lemon Bay are adjacent bodies of water lying on the west coast of Florida north of Charlotte Harbor. Gasparilla Sound is the more southerly of the two and communicates at its southern extremity with Charlotte Harbor through numerous passages between small islands, forming a chain extending from the mainland westward for a distance of 3 miles—about halfway across the sound. The principal channel from the sound to Charlotte Harbor is the most westerly passage lying between Devil Fish Key and Gasparilla Island. This channel has a depth of 4½ feet. There is another channel lying east of Devil Fish Key, between it and Carra Pelau Key; but this channel is crooked and shallow.

Communication between Gasparilla Sound and the Gulf of Mexico is possible by two entrances through the narrow strip of land lying west of the sound. The most important entrance is Gasparilla Pass, lying north of Gasparilla Island, with a depth of 6½ feet. The other is Boca Nueva, lying north of Little Gasparilla Island and having a depth of 3½ feet. A depth of 4½ feet at mean low water can be carried from Boca Nueva through Gasparilla Sound to Charlotte Harbor.

The length of the sound is 9 miles; its width is 6 miles at its southern end and one-fourth mile at its northern end. From the northern end of Gasparilla Sound a channel 1 mile long, 40 to 250 feet wide, and 1 foot deep at mean low water leads into Lemon Bay.

Lemon Bay has a length of 14 miles and varies in width from 200 feet to 1 mile. The depth varies from one-half foot to 15 feet, but throughout the greater portion of the bay there is an available channel depth of 3½ feet at mean low water. Communication with the Gulf of Mexico is possible through two passes, New Pass and Stump Pass, situated 2 and 3½ miles, respectively, from the south end of the bay. The depth in New Pass is 6.2 feet, and in Stump Pass 7 feet. The coast survey charts show another entrance called Bocilla Pass, but this no longer exists. The north end of Lemon Bay is entirely closed. The nearest inland waterway to the north is Sarasota Bay, 5 miles distant.

The commerce to be affected by improvement of these waters is chiefly the fishing industry. Lemon Bay is an especially fine fishing ground. The shipment of fish from Lemon Bay was estimated in 1899 at $50,000 per year. This business is growing. The fish are shipped principally to Punta Gorda, the nearest railroad terminus. The improvement most desired is a deepening of the cut-off between Lemon Bay and Gasparilla Sound, so as to give the fishing boats an inside passage from the fishing grounds to the shipping point. To ship fish by either Punta Gorda or Tampa it is necessary for boats from Lemon Bay to go out into the Gulf. During the winter season the strong northerly and westerly winds render the outside passage dangerous for small craft, and commerce is thereby hampered.

The needs of commerce will be met by a channel 100 feet wide and 3½ feet deep at mean low water between Gasparilla Sound and Lemon Bay. The cost of such a channel will be small, and I consider the locality worthy of improvement to that extent.

To estimate the cost of improvement a survey will be necessary, covering the north end of Gasparilla Sound, the southern end of Lemon Bay, and the connecting channel. The cost of this survey is estimated at $1,100.

Very respectfully, your obedient servant,

HERBERT DEAKYNE,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., September 19, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

I consider the work of sufficient importance to justify a survey to determine the cost of improvement, and recommend that a survey be made.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 23, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie.

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., February 19, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer, the indorsement of the division engineer, and several letters from interested persons.

The district officer regards the locality as worthy of improvement by the United States, and states that a channel 100 feet wide and 3½ feet deep from Gasparilla Sound to Lemon Bay would meet present needs. He recommends a survey at a cost of $1,100. The division engineer considers the work of sufficient importance to justify a survey.

The commerce involved is small and local in its character, and it is by no means evident that providing the channel in question would result in any adequate increase. Even without a detailed estimate, based upon a survey, it is plain to the Board that the cost of making the improvement recommended would be entirely disproportionate to the resulting benefits.

The Board is therefore compelled to believe that it is not advisable for the United States to undertake this improvement.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. W. H. CALDWELL, ASSISTANT ENGINEER.

United States Engineer Office,
Tampa, Fla., September 5, 1902.

Captain: I have the honor to submit the following report on a preliminary examination of "Gasparilla Sound and Lemon Bay, including cut-off," made August 26 and 27, 1902, in accordance with your instructions.

A preliminary examination of Lemon Bay was made by me in August, 1899, under the direction of Capt. Henry Jervey, Corps of Engineers, United States Army; and a survey of the head of the bay from Red Lake to New Pass was made under Captain Jervey's direction in November and December of that same year. Reports of both the preliminary examination and survey are contained in the Annual Report of the Chief of Engineers, 1900, pages 2054–2065.

Gasparilla Sound and Lemon Bay are on the west coast of Florida, separated from the mainland by a chain of keys and a narrow peninsula. A low neck of land divides Lemon Bay and Gasparilla Sound. Through this neck of land is a crooked channel about 1 mile long, 40 to 250 feet wide, with an available depth of 1 foot at mean low water.

Gasparilla Sound is bell shaped, being widest at its southerly end. A chain of small keys extends about halfway across its lower end from the mainland. It may be entered from Charlotte Harbor through two channels. The main or westerly channel is the wider passage. It leads between Devil Fish Key and Gasparilla Island, and has an available depth of about 4½ feet. The other channel lies between Carra Pelau Key and Devil Fish Key. This passage is very crooked, and has an available depth of only 2 feet. The sound may be entered from the Gulf of Mexico through Gasparilla Pass, northward of Gasparilla Island, where the available depth is 6½ feet, and through Boca Nueva, northward of Little Gasparilla Island. The latter pass has moved during the past few years about three-fourths mile southward of the position shown on the Coast Survey charts. It has shoaled somewhat, the available depth on August 27, 1902, being 3½ feet.

Gasparilla Sound is 9 miles long, from one-fourth to 6 miles wide, and varying in depth from one-half to 9 feet. In the main channel of the sound the least depth between Boca Nueva and Charlotte Harbor is 4½ feet.

Lemon Bay is long and narrow. Two passes lead into the bay from the Gulf of Mexico. New Pass, opposite Grove City, has an available depth of 6.2 feet. Stump Pass, about 1½ miles northward of New Pass, has an available depth of 7 feet. Bocilla Pass, shown on the Coast Survey charts, no longer exists.

Lemon Bay is 14 miles long, from 200 feet to 1 mile wide, and varies in depth from one-half to 15 feet. Through the greater portion of the bay there is available channel of about 3½ feet at mean low water.

The improvement desired is a channel leading from Gasparilla Sound into Lemon Bay 3½ feet deep and 100 feet wide.

The principal commercial interests of Gasparilla Sound and Lemon Bay are the fisheries and truck farming. Along the eastern shore of Lemon Bay are two villages, namely, Englewood and Grove City. There is a hotel at each place kept open during the tourist season. There is no village on Gasparilla Sound, and the country around is sparsely settled. But the United States and West Indies Railroad Company are building southward from Braidentown on the left bank of Manatee River, and will have a terminus on Gasparilla Island at Boca Grande. This road will transport many of the products of that region, but the necessity of a navigable waterway between Lemon Bay and Gasparilla Sound will not be diminished. Punta Gorda and Tampa will still be the depots for supplies, and boats bound for either place will prefer the inside passage. As conditions now are a boat bound from the sound to the bay is obliged to run 6 or 8 miles in the open Gulf. During the winter season when northerly and westerly gales prevail such a voyage is dangerous for small craft. Any improvement of waterways that will lessen the outside passage acts to augment the coastwise traffic.

The commerce of this section is comparatively small, but is increasing. Below is a tabulated statement of the commercial statistics for the twelve months ending July 1, 1902:

Shipments to and from Gasparilla Sound and Lemon Bay.

INBOUND.	Tons.
General merchandise	257
Fertilizers	50
Hay and grain	10
Shingles	29
Lumber	197
Total	543
OUTWARD BOUND.	
Salted fish	200
Fresh fish	1,076
Total	1,276

The inbound and outward bound freight aggregates 1,819 tons.

A survey will be necessary for the formulation of plans and estimates for improvement of the channel. I estimate the cost of a survey of Gasparilla Sound and of Lemon Bay from Boca Nueva to New Pass will be $1,100.

Very respectfully,

W. H. CALDWELL,
Assistant Engineer.

Capt. HERBERT DEAKYNE,
Corps of Engineers.

P 20.

PRELIMINARY EXAMINATION AND SURVEY OF HILLSBORO BAY, FLORIDA.

[Printed in House Doc. No. 306, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 19, 1903.

SIR: I have the honor to submit herewith, for transmission to Congress, reports of August 14, 1902, by Capt. Herbert Deakyne, Corps of Engineers, and of November 13, 1903, by Capt. Francis R. Shunk, Corps of Engineers, upon preliminary examination and survey, respectively, authorized by the river and harbor act approved June 13, 1902, of Hillsboro Bay, Florida—

With a view to determining such extension and increase of channel depth as will accommodate present and prospective commerce, with turning basin.

The channel in Hillsboro Bay is the means of water communication with the city of Tampa, which is situated at the head of the bay and at the mouth of Hillsboro River. A project for improvement is now in force which has for its object the formation of a channel 12 feet deep at mean low water from a point in the city of Tampa to the mouth of the river and thence to the 12-foot contour in the bay, with a width of 200 feet in the river and 150 feet in the bay, and the object of the present investigation is to ascertain the advisability of securing increased facilities for shipping as indicated above. Existing commercial needs are not fully met by the present project depth of 12 feet, as vessels of moderate draft are compelled to lighter a portion of their cargoes before they can reach the wharves at Tampa.

The locality is regarded by the district officers as worthy of further improvement by the United States, and in the survey report of November 13, 1903, Captain Shunk submits estimates of the cost of securing channels with depths of 15, 18, 20, and 24 feet, respectively. He recommends the adoption of a 20-foot depth, and this recommendation is concurred in by the division engineer, Lieut. Col. James B. Quinn, Corps of Engineers. The estimated cost of securing a 20-foot channel is $837,335, with 10 per cent to be added for contingencies, or in round numbers $925,000.

These papers have been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and attention is respectfully invited to the Board's report of December 4, 1903, in seventh indorsement thereon.

For the reasons given the Board believes that the proper channel to be provided for the commercial needs of Tampa is one 18 feet deep, 270 feet wide in the river and 150 feet wide in the bay, with a turning basin 450 feet wide and 1,050 feet long. The cost of such a channel is estimated by the district officer at $630,000, with $12,000 annually thereafter for maintenance. The Board believes it to be advisable that the United States undertake the improvement of the locality to this extent.

In this connection, however, attention is invited to the views of the Board of Engineers in regard to the relative importance commercially of the two cities, Tampa and Port Tampa, the latter of which has now a channel of approach with depth of 24 feet at mean low water, which has been secured under appropriations made for "improving Tampa Bay, Florida." The existing project for Tampa Bay contemplates securing a channel depth of 27 feet, and was adopted by Congress after the report of a preliminary examination and survey in which a depth of 24 feet was recommended. The recommendation of the Board of Engineers in favor of increased channel depth in Hillsboro Bay to Tampa is contingent upon the Board's further recommendation that the expenditures upon the Port Tampa channel cease as soon as the 24-foot channel has been enlarged to the project widths, omitting further excavation to the depth of 27 feet.

I concur in the views and recommendations of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

PRELIMINARY EXAMINATION OF HILLSBORO BAY, FLORIDA.

UNITED STATES ENGINEER OFFICE,
Tampa, Fla., August 14, 1902.

GENERAL: I have the honor to submit the following report on a preliminary examination of "Hillsboro Bay, with a view to determining such extension and increase of channel depth as will accommodate present and prospective commerce, with turning basin," made in accordance with the act approved June 13, 1902.

The examination was made by Mr. W. H. Caldwell, assistant engineer, on July 23 and 24, 1902, and attention is invited to Mr. Caldwell's report herewith.

The channel in Hillsboro Bay is the means of water communication with the city of Tampa, which is situated at the head of this bay and at the mouth of the Hillsboro River. Before improvement the channel from Tampa to deep water in the bay was narrow and crooked and had an available depth of about 5 feet. Across the mouth of the river was a ledge of rock on which the depth was 7 feet.

The original project, adopted in 1879, had for its object the formation of a 9-foot channel from the 9-foot curve in the bay to wharves at Tampa, in Hillsboro River, 150 feet wide in the bay and 200 feet wide in the river, at an estimated cost of $97,000. Nearly $70,000 was expended under this project. In 1888 this project was modified to provide for the formation and maintenance of a channel 8 feet deep in Hillsboro Bay and Hillsboro River to the city of Tampa, and a channel 20 feet deep and 200 feet wide from the outer bar to Port Tampa.

By 1893 the operations had resulted in a channel 200 feet wide and 9 feet deep in the mouth of Hillsboro River, and 75 to 100 feet wide in the bay, with an available depth of not more than 7 feet.

The present project is for the formation of a channel 12 feet deep at mean low water, extending from a point about 100 feet south of the Lafayette Street Bridge, in Tampa, to the mouth of the river, and thence to the 12-foot contour in the bay, with a width of 200 feet in the river and 150 feet in the bay. The channel has been excavated to the required depth and about 40 per cent of the required width. Funds are now available to carry the project nearly, if not quite, to completion.

The city of Tampa has had a large growth since the first steps were taken toward the improvement of the channel. The population in 1880 was 720; in 1890, 5,532; in 1900, 15,839. These are the official figures, but it should be noted that there are extensive suburbs not included in the above figures. Including them, the number of people at present in this community, which for commercial discussion may be considered one city, is about 24,000.

The commerce of Tampa has grown in recent years more rapidly than the population. During the last four years it has grown from 32,000 tons to 172,000 tons. The growth since the channel depth was increased to 12 feet, about a year and a half ago, even with the restricted width of the channel, has been very marked.

The present commerce of Tampa consists principally of cattle, grain, hay, lumber, vegetables, fruit, fish, naval stores, coal, wood, fertilizer, building material, and general merchandise. The cattle are shipped principally to Cuba; the lumber is shipped to local points and Gulf ports; the naval stores are shipped to New York; fertilizer is shipped to local points; vegetables, fruit, fish, wood, and building material come in from local points; grain and hay come from Gulf ports; general merchandise comes from New York and Gulf ports, and coal from New York or other Atlantic ports. The demands of this commerce are not fully met by the depth of water provided for in the present project. The line of schooners operated between here and New York is hampered by lack of depth. Larger schooners could be used and freight rates could be reduced if deeper water were available. Some of the schooners now used have to be anchored in the bay and a part of their cargo has to be lightered before they can reach Tampa. The steamer line operated between here and New York is placed at even greater disadvantage, for the entire cargo must be lightered to Tampa.

The lumber trade suffers from inability to bring large vessels to Tampa. The shipment of naval stores could be largely increased if better facilities could be had.

The prospective commerce of Tampa includes the increase of the present commerce with the increase in population, and the enlargement of the territory for which Tampa is the distributing point and the establishment of new commerce. A large amount of Central American fruit trade could be carried on through Tampa if the channel depth were sufficient to allow fruit steamers to enter. At present the fruit trade is almost entirely local. The shipment of lumber, naval stores, and phosphate would be largely increased. No consideration is given to the possible trade through the isthmian canal, for the reason that the location of the canal is still uncertain, and the time of its completion is so far ahead that commercial conditions may change materially in the meantime.

The requirements of this prospective commerce do not call for a large increase in channel depth. There is no reason for an attempt to make Tampa a port for deep-water vessels. It should be able to accommodate the lighter classes of vessels engaged in the Atlantic and Gulf coasting trade. A deep-water port exists at Port Tampa, but this fact does not render further improvement of Hillsboro Bay unnecessary. Deep-water traffic must continue to use Port Tampa, but for the class of traffic now using Hillsboro Bay there is a decided advantage in being able to land a cargo at Tampa. Port Tampa is 9 miles from Tampa. They are connected by a single railroad line which also controls the docks at Port Tampa, and there is no competition in transportation of freight between the two places. It is stated that the rate for moving certain kinds of merchandise from a ship at Port Tampa to Tampa is about equal to the rate on the same merchandise from New York to Tampa direct by water.

The need of a turning basin at Tampa is unquestionable, aside from any increase in channel depth. The present depth is sufficient to permit the entrance of some vessels that are unable to turn around after reaching the city. The result is that in most cases they lighter their cargoes from the bay in preference to incurring the risks of being towed out stern foremost.

I consider Hillsboro Bay worthy of improvement and recommend a survey at an estimated cost of $3,000. The extent of the improvement that can be effected at reasonable expense will depend upon the results disclosed by the survey, especially in regard to the amount of rock that is encountered.

Very respectfully, your obedient servant,

HERBERT DEAKYNE,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 18, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

In my judgment the proposed improvement is an important one and worthy of being undertaken by the United States.

On July 31 last there were over $158,000 available for the improvement of Hillsboro Bay, and it seems to me that the survey might be made in connection with that improvement and at its cost.

It is recommended that an allotment of $3,000 be made for the survey.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 22, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., February 5, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board for Rivers and Harbors has considered the within report of the district officer, the recommendation contained in the indorsement of the division engineer, and various communications containing data on commercial statistics and the necessity for the improvement, and has, by a committee, made a personal inspection of the locality and held a public hearing at Tampa, Fla., at which interested persons had full opportunity to present their views.

It is the opinion of the Board that the commerce involved is so large and of such a general character as to warrant further improvement of the locality by the General Government, provided such improvement can be made at a reasonable cost, which can only be determined by a survey.

The Board therefore recommends that a survey be ordered, and that the sum of $3,000 be allotted for the purpose, as recommended by the district and division engineers. Estimates of the cost of channels 15, 18, and 20 feet in depth should be made by the district officer.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

[Fourth indorsement.]

Office Chief of Engineers, U. S. Army,
February 13, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Hillsboro Bay, Florida, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors in the preceding indorsement, I recommend that a survey of the locality as proposed be authorized.

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

[Fifth indorsement.]

War Department,
February 24, 1903.

Approved as recommended by the Chief of Engineers.

Wm. Cary Sanger,
Assistant Secretary of War.

[Sixth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, November 28, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors with report of survey as recommended.

By command of Brig. Gen. Gillespie:

H. F. Hodges,
Major, Corps of Engineers.

[Seventh indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., December 4, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

In third indorsement hereon the Board of Engineers for Rivers and Harbors expressed the opinion that the commerce involved is of such a general character as to warrant further improvement of the channel through Hillsboro Bay, Florida, by the General Government, provided such improvement can be made at a reasonable cost, which can only be determined by a survey.

The Board has considered the accompanying report of the district officer on a survey of Hillsboro Bay and the mouth of Hillsboro

River, Florida, with estimates of cost of channels of several different depths, from Tampa to deep water in the bay. These estimates are as follows:

Depth.	Estimated cost.	Depth.	Estimated cost.
15 feet	$265,516	20 feet	$837,335
18 feet	569,259	24 feet	1,464,042

In each case 10 per cent should be added for engineering and contingencies. The district officer recommends a channel of 20 feet depth, in which recommendation the division engineer concurs.

To June 30, 1903, there had been expended upon the channel through Hillsboro Bay, and in the river mouth, the sum of $293,609.54, which has resulted in a depth of 12 feet at mean low water, and a width of 200 feet in the river, and nearly 150 feet in the bay. The development of this channel has had a very marked effect upon the commerce of Tampa, which has increased from 32,000 tons to 172,000 tons in the past four years. The demands of this commerce are not fully met by the depth provided in the 12-foot channel of the existing project. Vessels of moderate draft are now obliged to lighter portions of their cargoes before they can reach the wharves at Tampa.

To Port Tampa, only 9 miles distant from Tampa, there is at present a channel from the Gulf of Mexico with a least depth of 24 feet at mean low water. The least width is 72 feet for a very short distance; another short section has a width of 128 feet. Most of the channel is now 300 feet wide. The present project for the Port Tampa improvement proposes, first, to secure a 24-foot channel 500 feet wide on the bar and 300 feet wide in the bay, and then to increase the depth to 27 feet.

It was clearly shown at the public hearing referred to in third indorsement hereon that, owing to excessive wharf and freight charges, it is practically impossible for the shippers of Tampa to do business through Port Tampa. They are now depending and must continue to depend upon such a channel as they can get up to their own wharves. Notwithstanding the deep water already secured to Port Tampa, Tampa has continued to develop, and has firmly established itself as the entrepôt of the western half of the Florida peninsula. There is no business at Port Tampa other than the transfer of through freight from rail to water, or vice versa, and the tonnage is large mainly because of the shipments of phosphate rock.

The great distance by rail from Tampa or Port Tampa to the States lying to the north of Florida forbids the belief that either locality can ever become an important competitor for the general business of the country with the existing deep-water ports of the South Atlantic and Gulf coasts. This fact and the failure of Port Tampa more completely to fulfill the harbor requirements of this vicinity induce the Board to recommend that expenditures cease upon the Port Tampa channel as soon as the depth is 24 feet over the projected widths. It is believed that the Port Tampa channel work, which is understood to be under contract, can at that time be terminated upon terms favorable to the United States. The amount that may thus be saved in the case of the Port Tampa work will accomplish a large part, probably one-half, of the improvement hereinafter recommended for the Tampa channel. The two projects are so related one to the other that the

Board has felt obliged to consider them together, and in recommending the Hillsboro Bay improvement has been largely influenced by the fact that it is not yet too late to reduce the scope of the Port Tampa channel project. In this connection attention is invited to the fact that a 27-foot channel to Port Tampa was adopted by Congress in the act of March 3, 1899, following reports upon preliminary examinations and surveys recommending a 24-foot channel.

To handle economically the limited business tributary to Tampa it is believed that a proper channel is one 18 feet deep, 270 feet wide in the river and 150 feet wide in the bay, with turning basin 450 feet wide and 1,050 feet long. Including engineering and contingencies, the cost of such a channel is estimated by the district officer at $630,000. The Board believes that the annual cost of maintenance will not exceed 2 per cent of the original cost, or, say $12,000. The Board believes it to be advisable that the United States should undertake this improvement.

For the Board:

Chas. J. Allen,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

REPORT OF MR. W. H. CALDWELL, ASSISTANT ENGINEER.

United States Engineer Office,
Tampa, Fla., July 31, 1902.

Captain: I have the honor to report that in accordance with your instructions I made a preliminary examination of Hillsboro Bay on July 23 and 24.

Several examinations and surveys have been made with a view of improving the channel leading into Tampa. The earliest undertaken by the Engineer Department was made in 1871. Another was made in 1879, the report of which is contained in the Annual Report of the Chief of Engineers, 1879, pages 870 to 873. From the latter survey a project was formulated and adopted for improving the channel, and work commenced April 27, 1881. In 1888 the original project was modified. Work was stopped on the channel June 3, 1893. A plan and estimate were submitted June 3, 1898, for the improvement of Hillsboro Bay, Florida, from its confluence with Tampa Bay through Hillsboro Bay and River to the city of Tampa, a preliminary examination having been made in November and December, 1896. The report of this plan and estimate is contained in the Annual Report of the Chief of Engineers, 1898, pages 1357 to 1360. Work was commenced December 6, 1899. The result accomplished is printed on page 1759 of the Annual Report of the Chief of Engineers for the year ending June 30, 1901.

Hillsboro Bay is about 10 miles long, in a general north and south direction, and has an average width of about 4½ miles. At the confluence of Hillsboro Bay with Tampa Bay the channel is obstructed by shoals of 10 to 11 feet, mean low-water depth. A practicable channel way exists between the shoals, having a least mean low-water depth of 12.5 feet. Length of the channel through these shoals is about 2.8 miles. At its inner end is a pocket, with a maximum depth of 23 feet. From that pocket to the outer end of the newly dredged channel (that leads into Tampa) is 4 miles, and the depth varies from 12 to 17 feet. The dredged channel is 12 feet deep; 13,790 feet long, and 60 feet wide in the bay; 2,094 feet long and 80 feet wide in the river.

The city of Tampa is at the mouth of Hillsboro River, which empties into the northwestern end of Hillsboro Bay. The city now has a population of about 25,000, it having grown from a village within the past few years. There is a steamer line from Tampa to Mobile, Ala., making trips every ten days; another steamer line makes trips to Mobile irregularly, but has averaged one trip a month during the past year; a steamer line to New York makes a trip monthly; a schooner line to New York makes a trip every three weeks; a schooner line to New Orleans, La., makes a trip every month; a steamer line gives a double daily service between Tampa and Manatee River landings; a steamer makes three trips per week to Sarasota Bay, and a steamer makes daily trips to St. Petersburg, Fla. Altogether there are 8 steamboats and 57 sailing vessels engaged in the carrying trade of Hillsboro Bay. Several schooners, foreign and domestic, constantly ply between Tampa and Central American ports, engaged in fruit and lumber transportation.

The steamers from New York have to lighter their cargoes, there being insufficient water for them to reach the wharves at Tampa. For the same reason many sailing vessels have to lighter a portion of their cargoes. Lightering the cargoes is very expensive, for the vessels anchor in the open bay where they are exposed to every wind.

The desire for extension and increase of depth of the channel and for a turning basin arises from the following causes:

(1) Necessities of shipping already making this port.

Certain vessels using the channel have no difficulty on account of draft, but experience trouble in turning around because of their length.

(2) Necessities of shipping that can not enter the channel and now lighter their cargoes.

These craft, steamers and sailing vessels, draw more water than depth of present channel.

(3) Necessities of shipping that would engage in the lumber and naval stores carrying trade if the depth of the channel now permitted.

Great quantities of lumber would be exported from here by Tampa firms if the available channel depth permitted the charter of larger vessels than now enter.

Naval stores would be shipped in greater quantities also if they did not have to be lightered to the large ships that anchor in the bay.

(4) Necessities of longer mooring space.

Narrowness of the river at Tampa limits the mooring space, and present shipping often congests the harbor area. Relief would be afforded by extending the channel up stream. Furthermore, access would be given to lumber mills and the marine railway. The nearest other ways that can haul out heavy vessels is at Mobile, 360 miles distant.

The commercial growth at Tampa, the port of Hillsboro Bay, has been large and rapid. Commerce of Hillsboro Bay for the last four calendar years is as follows:

	Tons.		Tons.
1898	32,070	1900	96,029
1899	87,740	1901	131,208

The commercial statistics of Hillsboro Bay for the year preceding month of this report, namely, July 1, 1901, to July 1, 1902, are given below in detail:

Inbound freight, Hillsboro Bay, Florida, for the year ending July 1, 1902.

Articles.	Weight.	Articles.	Weight.
	Tons.		*Tons.*
General merchandise	27,299	Oysters	385
Grain and hay	14,240	Fish	2,405
Tobacco	1	Bananas, plantains, pineapples, and cocoanuts	2,920
Naval stores	1,017	Oranges, grape fruit, and lemons	7,688
Hides	56	Honey and sirup	9
Sidewalk material, sand, and rock	19,350	Vegetables	9,012
Coal	1,100		
Wood for boiler fuel	6,450		
Cattle	20	Total	91,952

Besides the above total of imports, 6,400 tons of logs were towed across Hillsboro Bay to be used for piling and fuel.

Outward bound freight, Hillsboro Bay, Florida, for the year ending July 1, 1902.

Articles.	Weight.	Articles.	Weight.
	Tons.		*Tons.*
Cattle	8,450	Grain and hay	7,040
Oranges, grape fruit, and lemons	835	Cement and lime	1,200
Vegetables	1,158	Brick	2,500
Naval stores	969	General merchandise	7,393
Lumber and shingles	44,722		
Fertilizers	5,725	Total	79,992

The sum of the inbound and outward-bound freights, or total commerce, of Hillsboro Bay for the year ending July 1, 1902, is 171,944 tons.

Steamboats, running to Hillsboro Bay	8
Sailing vessels, registered	57
Small craft, not registered	80
Passengers carried, year ending July 1, 1902	30,000

A deeper channel in Hillsboro Bay would be of decided advantage. It would permit entrance of vessels already trading here, and also accommodate those additional ones required for present commerce. One firm of lumber exporters at Tampa were constrained to ship recently 6,500 tons of lumber from another port because vessels of sufficient draft to handle the cargoes could not enter Hillsboro Bay. Similar experience is had every week by dealers in general merchandise, coal, etc.

A channel 20 feet deep and a turning basin 500 feet square would accommodate any vessel now engaged in trade to Hillsboro Bay. A survey will be necessary upon which to base plans and estimates for such improvement. The survey is essential, because while dredging the 12-foot channel in 1899-1901 many changes were found to have taken place in the bottom contours since the last survey was made. Furthermore, borings must be taken to determine character of material to be removed. I estimate that the survey and construction of the charts would require the expenditure of $3,000.

Very respectfully,

W. H. Caldwell,
Assistant Engineer.

Capt. Herbert Deakyne,
Corps of Engineers, U. S. Army.

SURVEY OF HILLSBORO BAY, FLORIDA.

United States Engineer Office,
Jacksonville, Fla., November 13, 1903.

General: I have the honor to submit the following report of a survey of Hillsboro Bay, Florida, made in accordance with Department letter of February 28, 1903. Five tracings[a] are also forwarded herewith. The work was done by Mr. W. H. Caldwell, assistant engineer, from whose report I quote:

The field work of the survey was commenced on July 24, 1903, in compliance with your written instructions dated July 23, 1903, and was completed on September 28, 1903.

The plan of the survey was based upon information contained in the preliminary examination report of this bay that was submitted on July 31, 1902, to your predecessor, Capt. Herbert Deakyne, Corps of Engineers, United States Army. It included detailed surveys of all portions of the main channel from the bay entrance, between Gadsdens Point and Mangrove Point, to the city of Tampa at mouth of Hillsboro River.

(1) TRIANGULATION.

The scheme of triangulation covered the entire bay, extending from deep water in Tampa Bay, off the entrance of Hillsboro Bay, to the Lafayette Street Bridge (across Hillsboro River) at Tampa, an area of 48 square miles.

The main portion of the bay was covered by a system of primary triangulation, and the arms of the bay by a secondary system.

(2) BASE LINES.

A base line at Depot Key (established in October, 1902, in connection with the channel improvement) was used for the triangulation system. Its corrected length is 6,099.0339 feet. Two complete measurements of the base were made. The probable error of the mean result is 1 in 339,000.

Near the northern end of the triangulation system a check base was measured, and its corrected length deduced. This base line was located to form a side of one of the triangles of the system. The mean value of its length, obtained from the corrected measurement and the triangulation computation, was found to be 1,000.239 feet, the probable error of which is 1 in 77,000. Six triangles intervened between the primary and check bases.

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[a] Not printed.

The southern end of the triangulation system was tied to the Tampa Bay triangulation of the United States Engineers' survey made in 1896-97. The length of the common line as computed from the two surveys was found to be 30,486.70 feet, the probable error of which is 1 in 33,000. Eleven triangles intervened between the primary base and the nearest side of the Tampa Bay triangulation.

(3) STADIA WORK.

Surveys of Grassy Island, Depot Key, the dredged channel training wall and banks of Hillsboro River were made with transit and stadia.

(4) MAGNETIC VARIATION.

The magnetic variation of the needle was determined by observation of * Polaris at western elongation. Azimuth of the star was computed by the polar distance-latitude formula, and the variation of the needle found to be 1° 57′ E.

(5) TIDE GAUGES AND BENCH MARKS.

Tide gauges and bench marks were already established in the upper end of Hillsboro Bay, in connection with channel improvements there. A gauge was established in the lower end of the bay, near Gadsdens Point, and its readings recorded for a lunar month. The mean range of tide was found to be 2.2 feet. Two bench marks were established on shore at Gadsdens Point, and referenced to mean low-water level.

In the area of soundings and borings tide gauges, with zero readings at mean low water, were established from time to time in the immediate vicinity of the work.

(6) SOUNDINGS.

Soundings in the deeper water were obtained with lead and line. In shoal water cypress rods were used. The lead lines were marked every half foot, and the markings were checked daily to compensate for errors that might arise from stretching or shrinking. The lines were marked only to 27 feet, as the maximum depth of required estimates was 24 feet. The sounding rods, 12 feet long, were graduated to feet and tenths.

(7) BORINGS.

Borings were taken along the channel of deepest water from the 24-foot contour at entrance of Hillsboro Bay to the Lafayette Street Bridge at Tampa. In the bay, borings were taken about 500 feet apart; in the river, borings were taken about 90 feet apart. No rock was encountered above a mean low-water depth of 24 feet southward of a point 1,000 feet outside the mouth of Hillsboro River.

(8) CURRENTS.

Current observations were taken at different stages of the tide and under varying conditions of weather. Subsurface floats were used, the lower float being suspended at about two-thirds the depth of water. Positions of the sun and moon were favorable for obtaining mean maximum results; the sun was only 2° from the equator (north), and the moon was in perigee; the two bodies were in opposition. The maximum velocity of the observed tidal currents during an ebb stage was 1.328 feet per second; during flood, 1.134 feet per second.

(9) MAPS.

A general chart of the surveyed area, Hillsboro Bay, has been platted on a scale of 1:25,000. The lower, middle, and upper portions of the bay are shown in more detail on three charts, the scale of which is 1:10,000. A chart on a scale of 1:1,000 shows the upper end of the channel at the city of Tampa, the port of Hillsboro Bay. The hydrography not included in the scope of the survey was supplied from a copy of the original hydrographic sheet of the United States Coast and Geodetic Survey made in 1876.

Estimates have been prepared for channels 15, 18, 20, and 24 feet deep. The width proposed is 150 feet in the bay and 270 feet in the river. Side slopes of 1 on 3 have been provided for, and 1 foot extra depth has been allowed. A turning basin 1,050 feet long and 450 feet wide is proposed, as shown on the map. The location of this basin is convenient, and the cost of dredging will be relatively small. It will be necessary to place five snubbing posts along each side. These have been provided for in the estimates. The basin will permit the turning of a vessel 450 feet long under any conditions of wind and tide.

The material to be removed from the bay is sand, with a little mud and shell; from the river, solid limestone rock. Material taken from the river will have to be towed to dumping places in the bay. Material from the bay channel may be deposited near the cut, as the currents are gentle and no danger from high waves is to be apprehended. Dredging the soft material is estimated at 17 cents per cubic yard, rock removal at $3 per cubic yard.

Estimates.

Depth of channel.	Quantity of material.		Estimated cost.
	Rock.	Soft material.	
	Cubic yards.	*Cubic yards.*	
15 feet	47,830	717,800	*a* $265,516
18 feet	101,370	1,559,700	*a* 569,259
20 feet	146,030	2,348,500	*a* 837,335
24 feet	239,100	4,392,600	*a* 1,464,042

a Add 10 per cent for engineering and contingencies.

In my opinion this improvement is well worthy of being undertaken by the General Government, and I would respectfully recommend that the 20-foot depth be adopted. The commerce of Tampa, consisting mainly of fertilizers, grain, hay, fruit, and building material, is rapidly increasing, and a great many vessels are compelled to stop in deep water and lighter their cargoes to the wharves. In 1898 the commerce of Hillsboro Bay amounted to 32,070 tons; in 1900 the quantity had grown to 96,029 tons; in 1902 it attained a total of 169,844 tons. Detailed statistics are given in the Annual Report of the Chief of Engineers for 1903. There is every indication that the prosperity of the city is being held back by the insufficient depth of the channel. I am convinced that a channel of less depth would be found insufficient as soon as it was finished, and that an increase of depth would immediately be urged. It would seem to be in the end more economical to go to the 20-foot depth at once. This will probably be found sufficient for some years.

Very respectfully, your obedient servant,

Francis R. Shunk,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

(Through the Division Engineer.)

[Third indorsement.]

Office of the Division Engineer, Southeast Division,
Savannah, Ga., November 25, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

There is at present a channel, with a least depth of 24 feet, to Port

Tampa. This port is some distance from Tampa City and the dock privileges at Port Tampa are controlled almost if not quite by the Port Tampa Dock and Improvement Company, which has, therefore, a monopoly of the transportation of all merchandise which uses the 24-foot channel and is destined for Tampa City. The people of Tampa City naturally desire relief from this monopolistic state of affairs and desire equal navigation advantages.

It is not so apparent that present conditions would justify the expenditure of so large a sum as the 24-foot channel calls for, and as the 20-foot project seems to offer such relief as will be satisfactory for some time and will afford the necessary information in time for determining the necessity for further improvement, I concur with the district engineer in recommending a 20-foot channel and further believe that the increasing nature of the commerce warrants the construction of such a channel on the lines proposed.

James B. Quinn,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

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PRELIMINARY EXAMINATION AND SURVEY OF KEY WEST HARBOR, FLORIDA.

[Printed in House Doc. No. 567, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, February 19, 1904.

Sir: I have the honor to submit herewith, for transmission to Congress, reports of December 1, 1902, and January 14, 1904, by Capt. Francis R. Shunk, Corps of Engineers, on preliminary examination and survey of Key West Harbor, Florida, authorized by the river and harbor act approved June 13, 1902, as follows:

> Key West Harbor, with a view of determining the desirability and feasibility of securing a channel thirty feet in depth and four hundred feet in width through the ship-channel entrance into the harbor of Key West, and of said depth and two thousand five hundred feet in width and one mile in length in said harbor.

The harbor at Key West is at present under improvement by the United States in accordance with a project which contemplates securing a depth of 17 feet at mean low tide through the northwest channel of entrance.

From the survey report of January 14, 1904, it appears that to secure a channel of the dimensions named in the above-quoted item of the act of June 13, 1902, would require the expenditure of approximately $10,317,000.

In connection with this investigation the local officer has given consideration to a plan of improvement for the locality on lines laid down by representatives of the Navy Department. To accomplish such improvement Captain Shunk submits various estimates, ranging from $7,151,500 to $11,367,000.

These reports have been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and attention is respectfully invited to the Board's report of February 9, 1904, in eleventh indorsement thereon.

I concur in the view of the Board of Engineers for Rivers and Harbors that, so far as commercial interests are concerned, no improvement of Key West Harbor beyond that already contemplated is advisable.

Very respectfully, your obedient servant,

A. Mackenzie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Wm. H. Taft,
Secretary of War.

PRELIMINARY EXAMINATION OF KEY WEST HARBOR, FLORIDA.

United States Engineer Office,
St. Augustine, Fla., December 1, 1902.

General: I have the honor to submit a report of a preliminary examination of Key West Harbor, made in pursuance of the following item of the river and harbor act of June 13, 1902:

> Key West Harbor, with a view of determining the desirability and feasibility of securing a channel thirty feet in depth and four hundred feet in width through the ship-channel entrance into the harbor of Key West, and of said depth and two thousand five hundred feet in width and one mile in length in said harbor.

I have availed myself of material collected by Captain Herbert Deakyne, whom I relieved, in the charge of this district, and of such information as is contained in the records of this office; and I have also visited and inspected the place.

An examination was made in 1896 for the purpose of estimating the cost of improving this harbor so as to adapt it for use as a naval base, and attention is invited to the report therein submitted by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, U. S. Army, November 16, 1896.

The commercial statistics of Key West for the several years indicated are as follows:

	Tons.
1889	46,249
1892	228,543
1895	98,015
1898	72,968
1901	18,863

The commercial statistics for the year ending July 1, 1902, are tabulated below:

	Tons.
Inbound:	
General merchandise	9,680
Tobacco	394
Fertilizer	12,835
Grain	17
Hay	13
Cattle	650
Lumber and coal	17,800
Total	41,389
Outward bound, cigars, vegetables, fruits, etc	5,500

The sum of the inbound and outbound commerce aggregates 46,889 tons.

There are 17 steamers and 271 sailing vessels trading to Key West. Of the sailing craft, 160 are engaged in the sponge industry. About 9,000 passengers were carried by vessels entering Key West during the year ending July 1, 1902. In the same period 50 foreign ships called at the port for orders, and 17 United States naval vessels touched at the port.

The commerce of the place is not very large and does not appear to be increasing, and so far as commerce is concerned, with the contemplated improvement at the northwest entrance, the channels and depths will be sufficient.

Key West is, however, very important as a naval base. It has a modern coaling station of large capacity and large machine and repair shops. Additional land has recently been acquired, and extension and improvement of the naval station are contemplated. The largest vessels ought to have access to the station, and there should be sheltered anchorage for a fleet. Not much excavation would be required to give an entrance channel of the proposed dimensions. The present least depth is 27 or 28 feet, and this over a small area. For the proposed basin a good deal of excavation will be necessary. A large part of the material to be removed is probably soft rock.

I am of the opinion that the harbor is worthy of improvement by the United States to the extent of making a survey. In view of the importance and magnitude of the proposed work, I think that this survey should be very thorough and from the nature of the bottom a great many borings will be necessary. A careful estimate makes the probable cost of the survey $6,000.

Attention is invited to the inclosed copy of letter[a] of Capt. George A. Bicknell, U. S. Navy, with indorsements and copy of report[a] of J. M. Braxton, superintendent, regarding the desirability of the improvement.

Very respectfully, your obedient servant,

FRANCIS R. SHUNK,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

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[a] Not printed.

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 3, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

So far as the commercial importance of Key West is concerned it would not justify an improvement of the character desired. From a naval standpoint the question is entirely different. This subject was considered by a Board of Engineers, of which the present Chief of Engineers and the undersigned were members in 1896, in connection with the establishment of an advanced naval base of operations. The views entertained by me at that time are expressed in that report. Those are my views still. Under the circumstances I do not recommend that a survey be made at a cost of $6,000, as suggested by the district engineer.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
December 16, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

The report of November 16, 1896, by Lieut. Col. W. H. H. Benyaurd, Corps of Engineers, mentioned within, and that of the Board of Engineers in 1896, referred to by Colonel Hains, are of a confidential nature, but will be loaned for a reasonable time, upon request by the Board.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., February 17, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer, the indorsement of the division engineer, and a letter[a] from the Acting Secretary of the Navy containing the views of the General Board as to the necessity and desirability, from the naval standpoint, of the improvement contemplated by the act ordering the preliminary examination.

It is the opinion of the Board of Engineers for Rivers and Harbors that the interests involved are sufficient to warrant the improvement, provided a survey shall show that such improvement can be made at a reasonable cost.

The Board therefore recommends that a survey be authorized to determine the character, quantity, and approximate cost of the work necessary, and that the sum of $6,000 be allotted for this purpose, as recommended by the district officer.

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[a] Not printed.

The Board further recommends that, in addition to the estimate for the work described in the act of June 13, 1902, the report include an estimate of the cost of the work deemed advisable by the General Board of the Navy, viz, dredging an approach channel 33 feet deep and a basin 30 feet deep over the area included within the 18-foot contour in Man of War Harbor, provided this additional estimate can be made without increasing the cost of the survey.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
February 25, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Key West Harbor, Florida, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors in the preceding indorsement, I recommend that a survey of the locality, as proposed, be authorized.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

[Fifth indorsement.]

WAR DEPARTMENT,
February 28, 1903.

Approved as recommended by the Chief of Engineers.

E. ROOT,
Secretary of War.

[Sixth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
March 2, 1903.

Respectfully returned to Captain Shunk, inviting attention to the action taken by the Department in the preceding indorsements.

The survey authorized is assigned to your charge, and to defray the expenses connected therewith the sum of $6,000 is hereby allotted from the appropriation for examinations, surveys, and contingencies of rivers and harbors, act of June 13, 1902.

It is desired that your further report be submitted in duplicate, through the division engineer, as required, and that it contain any additional facts or arguments that may be deemed essential to permit of a full and complete consideration of the merits of this case by this Department and by Congress.

* * * * * * *

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Tenth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, January 23, 1904.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with report of survey as recommended.

By command of Brig. Gen. Mackenzie:

H. F. Hodges,
Major, Corps of Engineers.

[Eleventh indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., February 9, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

The existing project for the improvement of Key West Harbor contemplates improving the northwest channel of entrance to a depth of 17 feet at mean low tide. The commerce of Key West, both in and out bound, has been in recent years as follows:

	Tons.
1889	46,249
1892	228,543
1895	98,015
1898	72,968
1901	18,863
1902	46,889

So far as commercial interests are concerned no improvement of Key West Harbor beyond that already contemplated is advisable.

When in third indorsement hereon the Board recommended a survey of Key West Harbor with a view to a deep entrance channel and a basin 30 feet deep, the latter including what is now known as Man of War Harbor, there was before the Board a letter[a] signed by the Acting Secretary of the Navy quoting the views of the General Board of the Navy as to the importance of Key West as a naval base. From this letter the following is extracted:

> It is considered very desirable that the harbor should be improved to permit the entrance of vessels of deep draft, and it is recommended that steps be taken toward this end.
>
> The needs of the Navy would be attained if Man of War Harbor were dredged between the 18-foot curves to a depth of 30 feet and the approaches cleared for a main ship channel to the depth of 33 feet. These improvements would only give anchorage space for a limited number of large vessels, but by means of suitable dolphins along the sides of Man of War Harbor, placed sufficiently close to permit the proper securing of vessels, a large number would be provided for.

In a letter[a] from the Secretary of the Navy to the Secretary of War, dated June 10, 1903, the following statement is made:

> In view of the large expense of the improvements suggested in this report, this Department is not prepared at this time, and without further consideration, to recommend that they be undertaken.

The report referred to in the latter quotation is that of the late Rear-Admiral Belknap, upon an examination undertaken by him as a result of a letter from the Board of Engineers for Rivers and Harbors, dated January 8, 1903, requesting that the views of the Navy Department be ascertained as to the present and future importance of the harbor of Key West from a naval standpoint.

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[a] Not printed.

The report within indicates that to secure "a channel 30 feet in depth and 400 feet in width through the ship-channel entrance into the harbor of Key West, and of said depth and 2,500 feet in width and 1 mile in length in said harbor," as contemplated in the act of June 13, 1902, would require the removal of 2,177,000 yards of sand and 5,057,000 yards of rock at a total expenditure of $10,317,000. It appears further that an improvement such as that mentioned above in the quotation from the views of the General Board of the Navy would involve the removal of 592,000 yards of sand and 3,572,300 yards of rock at a total cost of $7,077,700.

Having in view the opinion of the Navy Department, as expressed in the quotation from the letter of the Secretary of the Navy dated June 10, 1903, the Board is of opinion that it is not advisable at this time to undertake any improvement at Key West Harbor beyond that contemplated by the existing project.

For the Board:

A. M. MILLER,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

SURVEY OF KEY WEST HARBOR, FLORIDA.

UNITED STATES ENGINEER OFFICE,
Jacksonville, Fla., January 14, 1904.

GENERAL: I have the honor to submit the following report upon the survey of Key West Harbor, Florida, made between May 1, 1903, and October 10, 1903.

The river and harbor act of June 13, 1902, provided for a preliminary examination and survey, if necessary, of—

> Key West Harbor, with a view of determining the desirability and feasibility of securing a channel 30 feet in depth and 400 feet in width through the ship-channel entrance into the harbor of Key West, and of said depth and 2,500 feet in width and 1 mile in length in said harbor [called basin B].

The report of the preliminary examination was submitted December 1, 1902, to which reference is invited. This report was referred to the Board of Engineers for Rivers and Harbors.

The Board, in third indorsement dated February 17, 1903, stated that, in its opinion, the interests involved are sufficient to warrant the improvement, provided a survey shall show that such improvement can be made at a reasonable cost. The Board further recommended that, in addition to the estimate for the work described in the act of June 13, 1902, the report include an estimate of the cost of the work deemed advisable by the General Board of the Navy, as shown in a communication therefrom, dated February 4, 1903, viz: Dredging an approach channel 33 feet deep and a basin 30 feet deep over the area included within the 18-foot contour in Man of War Harbor, provided this additional estimate could be made without increasing the cost of the survey.

Under date of February 18, 1903, the Secretary of War approved the recommedation of the Chief of Engineers that the survey of the locality as proposed be authorized.

Under date of March 2, 1903, the survey was assigned to this office, and the sum of $6,000 was allotted therefor from the appropriation for examinations, surveys, and contingencies of rivers and harbors, act of June 13, 1902.

By third indorsement, dated April 2, 1903, on letter of The Board of Engineers, dated January 10, 1903, requesting information regarding the physical conditions of the harbor bottom at Key West, the Chief of Engineers directed that two estimates for the basin be submitted—one for a basin 1,700 to 1,500 feet wide and 30 feet deep, designated "A," and one for a basin 1,500 to 1,400 feet wide and 30 feet deep, designated "A1," with an entrance channel 600 feet wide and 33 feet deep, all as shown outlined on a Coast Survey map[a] accompanying.

Under date of April 6, 1903, the Chief of Engineers directed that, in view of the fact that Admiral Sands had found at Pearl Harbor that the coral formed only a comparatively thin crust over soft sand, a very considerable number of borings, well distributed over the entire area and carried down to the full depth to which dredging is required, should be made.

The survey was made by Mr. J. M. Braxton, assistant engineer. The amount originally allotted for the survey having been found insufficient, an additional allotment of $1,500 was made August 29, 1903.

Soundings were taken over the entire area, from the entrance through the ship channel to the north end of Man of War Harbor. Two hundred and seventy-nine borings to hard stratum and 98 borings to 30 feet below mean low water were taken in Man of War Harbor, and 179 borings to hard stratum and 28 borings to 30 feet below mean low water were taken in the entrance channel.

A map[a] in two sheets, showing the existing depths of water, and a map[a] showing the depths to rock where borings were taken, are submitted herewith. The borings showed that it would be advisable to make changes in the boundaries of the proposed basins, as indicated by the Board of Engineers, and this has been done without, however, changing the areas proposed by the Board.

The borings show six kinds of material—mud, sand, shell, and three grades of rock, called for convenience first, second, and third. All the material is calcareous.

The mud is very soft and dries into a fine powder, white or grayish in color. When the excess of water has drained off this mud will stand with almost vertical sides. It is much used in Key West for filling in reclaimed land.

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[a] Not printed.

The sand is apparently disintegrated coral. The grains are flat and sharp. When coarse this sand is loose and easily removed; when fine it packs very hard and offers as much resistance to boring as the soft rock.

Broken shell is distributed through the mud and sand and occasionally occurs in layers and pockets.

The first grade of rock is quite soft. Samples when first brought up can be broken with the fingers. It hardens on exposure. The usual rate of boring in this rock, with hand apparatus, was about 1 inch per minute.

No sharp line can be drawn between the first and second grades of rock. The usual rate of penetration in the second grade was about half an inch per minute, or a little less, but there were intermediate rates between first and second. The second-grade rock lies, in general, below the first grade.

The third grade of rock is quite hard and gives a ringing sound when struck. The rate of penetration was one-eighth of an inch per minute, or less. This rock usually occurred in thin layers, two-tenths or three-tenths of a foot in thickness, lying between layers of soft rock. In general it lies deep.

In only a very few instances was sand or mud found underlying rock, and then only in pockets. Everything below the general rock surface may be assumed to be rock. The sand, mud, and shell can be removed by a pump dredge. The first-grade rock may be excavated by a dipper dredge. A specially constructed dipper dredge, of considerable power, would be needed for the second grade. I think that such a dredge would also remove the third-grade rock, since it lies in thin layers and would probably break. Some blasting might, however, be needed for the lower layers of third-grade rock.

In letting a contract it would not be possible to discriminate between the various kinds of soft material and the various kinds of rock. There would have to be one price for soft material, including mud, sand, and shell, and one price for rock, including the three grades. In preparing the estimates, however, the estimated quantities of the three grades of rock are given, in order to show approximately the nature of the work to be done.

Investigations made in connection with the improvement of Biscayne Bay, Florida, indicate that the material found there is very similar to the material found at Key West. A contract has recently been awarded for excavating 154,000 cubic yards of sand and 92,000 cubic yards of rock at Biscayne Bay. The price for the sand excavation was 24 cents per cubic yard, and for the rock excavation $1.78 per cubic yard. In view of the fact that the quantities to be removed at Key West are so much greater, it is believed that 20 cents per cubic yard for soft material, and $1.75 per cubic yard for rock of all grades will be a safe estimate; provided, of course, that the entire work can be let at one time.

ESTIMATES.

For basin A, 1,700 to 1,500 feet wide and 30 feet deep:		
796,200 cubic yards of soft material, at 20 cents	$159,240	
1,675,300 cubic yards of first-grade rock, 853,400 cubic yards of second-grade rock, 6,800 cubic yards of third-grade rock, at $1.75	4,437,125	
		$4,596,365

For entrance channel 600 feet wide and 33 feet deep:	
1,280,000 cubic yards of first-grade rock, 38,100 cubic yards of second-grade rock, at $1.75	$2,306,675
Engineering and contingencies, about 10 per cent	766,960
Total	7,670,000

For basin A1, 1,500 to 1,400 feet wide and 30 feet deep:		
592,000 cubic yards of soft material at 20 cents	$118,400	
1,486,300 cubic yards of first-grade rock, 762,300 cubic yards of second-grade rock, and 5,600 cubic yards of third-grade rock, at $1.75	3,944,850	
		4,063,250
For entrance channel, 600 feet wide and 33 feet deep:		
1,280,000 cubic yards of first-grade rock and 38,100 cubic yards of second-grade rock at $1.75		2,306,675
Engineering and contingencies, about 10 per cent		707,775
Total		7,077,700

The outline of this basin follows roughly the 18-foot contour, and may therefore be taken to be the basin deemed advisable by the General Board of the Navy.

For basin B:		
2,177,000 cubic yards sand, at 20 cents	$435,400	
4,812,000 cubic yards rock, at $1.75	8,421,000	
		$8,856,400
For entrance channel:		
245,000 cubic yards of rock, at $1.75		428,750
Engineering and contingencies, about 10 per cent		1,031,850
Total		10,317,000

The proportions of the three grades of rock will be about the same as in basins A and A1.

Since the advisability of improving Man of War harbor depends upon the cost, it seems necessary to take note of the fact that a basin for naval purposes implies more than mere excavation. Moorings of some sort will have to be provided. These may be of various kinds:

(1) *Anchors and mooring buoys.*—It is assumed that anchors weighing at least 25,000 pounds will be required. As the harbor is sheltered from heavy seas, this weight will probably be sufficient.

25,000 pounds, at 5 cents	$1,250
10 fathoms 3-inch chain, at 5 cents	250
Buoy	300
Total	[a]1,800

These should be distributed at intervals of about 500 feet. This gives—

For basins A and A1, 41 moorings, at $1,800	[a]$73,800
For basin B, 58 moorings, at $1,800	[a]104,400

(2) *Dolphins of 10 piles each.*—The piles to be shod with iron and protected from the teredo by "Atlantic concrete pile coating."

10 piles placed, at $90	$900

These dolphins to be placed around the edges of the basin at intervals of 100 feet. This gives—

For basins A and A1, 176 dolphins, at $900	$158,400
For basin B, 183 dolphins, at $900	164,700

(3) *A concrete bulkhead along the east shore of the basin.*—Should this plan be adopted, the dredged material might be deposited behind

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[a] This estimate includes placing.

the bulkhead, so as to form a pier or mole projecting from the north side of the island. A suitable bulkhead would cost about $150 per linear foot in place.

For all basins.

7,000 feet of bulkhead, at $150	$1,050,000

Estimates with moorings.

Basin A with anchors	7,743,800
Basin A with dolphins	7,828,400
Basin A with bulkhead	8,720,000
Basin A1 with anchors	7,151,500
Basin A1 with dolphins	7,236,100
Basin A1 with bulkhead	8,127,700
Basin B with anchors	10,421,400
Basin B with dolphins	10,481,700
Basin B with bulkhead	11,367,000

The question of moorings will probably have to be determined by the Navy Department. The estimate is intended to give an idea of the cost of the completed basin.

The excavation of the basin and channel contemplated by the river and harbor act of June 13, 1902, is perfectly feasible, but does not seem to be advisable in view of the fact that one of the smaller basins would probably answer every purpose at less cost. As between basins A and A1, it does not appear to me that the greater size of A is of enough importance to justify the increased cost. If the improvement be adopted I would recommend basin A1.

Very respectfully, your obedient servant,

FRANCIS R. SHUNK,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE OF THE DIVISION ENGINEER, SOUTHEAST DIVISION,
Savannah, Ga., January 21, 1904.

Respectfully submitted to the Chief of Engineers, United States Army.

The nature of the improvement sought is apparently military rather than commercial, and, therefore, a subject for the consideration of a joint Army and Navy Board.

I believe, therefore, that in this case an expression of opinion upon the advisability of doing the work, or recommendations as to selections of project, is not required from the division engineer.

JAMES B. QUINN,
Lieut. Col., Corps of Engineers,
Division Engineer, Southeast Division.

P 22.

PRELIMINARY EXAMINATION OF MANATEE RIVER, FLORIDA, FROM ITS MOUTH TO ELLENTON AND THENCE TO RYE.

[Printed in House Doc. No. 117, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 1, 1903.

SIR: I have the honor to submit herewith a report, dated August 19, 1902, and report supplemental thereto, dated December 16, 1902, by Capt. Herbert Deakyne, Corps of Engineers, on preliminary examination of Manatee River, Florida, from its mouth to Ellenton, thence to Rye, ordered by the river and harbor act approved June 13, 1902.

This stream has heretofore been under improvement by the General Government, and in the opinion of Captain Deakyne, concurred in by the division engineer, Col. Peter C. Hains, Corps of Engineers (now brigadier-general, U. S. Army), the locality is worthy of further improvement to the extent of providing a channel at mean low water 9 feet deep from the mouth of the river to Rocky Bluff, and 4 feet deep from Rocky Bluff to Rye. The estimated cost of this work is $53,710.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors pursuant to the provisions of sections 3 and 14 of the above-mentioned act, and attention is invited to its report of February 12, 1903, herewith, and the accompanying memorandum of previous operations and existing conditions. The Board considers that the public commercial interests involved are sufficient to justify the continuance and extension of the improvement of this river by the General Government, to provide a channel 100 feet wide, 9 feet deep, from McNeills Point to Rocky Bluff, and 75 feet wide, 4 feet deep, from Rocky Bluff to Rye, as recommended by the district officer.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. HERBERT DEAKYNE, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Tampa, Fla., August 19, 1902.

GENERAL: I have the honor to submit the following report of a preliminary examination of "Manatee River, from mouth to Ellenton, thence to Rye," made in accordance with the river and harbor act of June 13, 1902.

The examination was made on August 4 to 6, 1902, by Mr. W. H. Caldwell, assistant engineer, to whose report, appended hereto, attention is respectfully invited.

Manatee River empties into the southern extremity of Tampa Bay. Its navigable length is about 23 miles, of which the lower end, for 12 miles, has the characteristics of an estuary. The section along the river is one of the most productive in Florida, especially in vegetables and citrus fruits.

Previous to improvement there was a shoal at the mouth of the river on which the depth was 7 or 8 feet at mean low water, and navigation in the upper river was obstructed by bars with 3 to 5 feet depth. The first project for improvement was adopted in 1882. It provided for a channel 100 feet wide and 13 feet deep from Tampa Bay to Shaw and McNeills points. In 1886 the project was modified so as to provide for a channel 100 feet wide and 8 feet deep at mean low water from Tampa Bay to the town of Manatee. This channel was completed, and in 1892 the original project was again adopted.

Work on the river has been done at various times, resulting in a channel at the present time with depths at mean low water of 9 feet to Braidentown, 8 feet to Manatee, 7 feet to Ellenton, 6 feet to Rocky Bluff, and 1½ feet to Rye. Ellenton is 10 miles and Rye 20 miles from the mouth of the river.

The commerce on the river is large and increasing, but it does not call for any increased facilities in the lower part of the river. The commerce is carried on chiefly by light-draft steamers running to Tampa. A railroad line connecting with the Seaboard Air Line near Tampa has recently been completed to the river.

The upper river has as yet no railroad facilities, and the depth is insufficient for the commerce on that portion of the river A fuller's earth refinery, of which the output is expected to be 15,000 tons per year, has been established at Rocky Bluff. Between this point and Rye the shipments of fruit, vegetables, and naval stores aggregate several thousand tons annually. To give the necessary facilities for this commerce there should be a channel 9 feet deep as far as Rocky Bluff, and 4 feet deep thence to Rye.

I consider Manatee River worthy of improvement to the extent specified, and recommend a survey, at an estimated cost of $1,000, to determine the cost of improvement.

Very respectfully, your obedient servant,

HERBERT DEAKYNE,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., August 22, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

I concur in the views of the district engineer that the Manatee River is worthy of improvement, but to what extent can only be determined by a survey and estimate.

I recommend that the survey be made.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 27, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., November 14, 1902.

Respectfully returned to the Chief of Engineers, United States Army.

Having given due consideration to the matters contained herein, the Board of Engineers for Rivers and Harbors finds itself possessed of insufficient data for determining the advisability of the improvement.

It is recommended, therefore, that an allotment of $300 be made the district officer for an extension of the preliminary examination, which shall include such survey as the amount above mentioned will permit, and enable the district engineer to present a tentative estimate of cost of the work he recommends herein.

For the Board:

A. MACKENZIE,
Colonel, Corps of Engineers,
Senior Member of Board.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
December 23, 1902.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with report containing the additional data desired.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Fifth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., February 12, 1903.

Respectfully returned to the Chief of Engineers, United States Army, with report of this date.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. W. H. CALDWELL, ASSISTANT ENGINEER.

United States Engineer Office,
Tampa, Fla., August 14, 1902.

Captain: I have the honor to report that in accordance with your instructions I made a preliminary examination on August 4–6 of "Manatee River from mouth to Ellenton, thence to Rye."

Several examinations and a survey have been made with a view of improving the channel of Manatee River. A preliminary examination was made in September, 1881, the report of which is contained in the Annual Report of the Chief of Engineers, 1882, pages 1319–1321. The first project for improvement of the channel was submitted and adopted in August, 1882. The project contemplated forming a channel 100 feet wide and 13 feet deep from Tampa Bay across the bar, up the river past Shaw Point, and on as far as McNeills Point at the village of Palma Sola—a distance of about 4 miles. Dredging was done on the bar from March 26 to April 14, 1883, and from February 18 to April 25, 1884, resulting in a channel 12.5 feet deep, 60 feet wide for a length of 1,750 feet, and 35 feet wide for a length of 400 feet. Examination of the river in August, 1886, showed that the cut across the bar had shoaled some.

For reasons based upon commercial and engineering considerations it was determined in 1886 to dredge an 8-foot channel across the shoal between the villages of Braidentown and Manatee. The dredging was done between August 22, 1887, and September 27, 1887, resulting in a channel section 2,412 feet long, 65 feet wide, and 8 to 9 feet deep. A survey of the river was made in December, 1887, and January, 1888, under the direction of Capt. (now major) W. M. Black, Corps of Engineers, U. S. Army. The survey extended from the bar at river entrance to Mitchellville, the head of navigation. The survey developed that the cut dredged on the bar in 1883–4 had disappeared, and that a shoal over which the depth was only 6.2 feet had formed at upper (eastern) end of the cut between Braidentown and Manatee village. The latter cut was widened 40 feet along its southern edge in 1889. Dredging commenced on July 31, 1889, but was stopped in a few days on account of breakdown of machinery. Operations were resumed October 9, and the cut completed December 23 of that same year, viz, 1889. The finished channel was 105 feet wide in its middle portion, bell-shaped at both ends, and 8 to 9 feet deep.

On June 18 and 19, 1892, an examination was made of the shoals about one-half mile below Sneads Point, and of the bar at entrance of river. The channel around the shoal was long and tortuous, and a considerable portion of it through water 8 feet deep. Depth on the bar at river entrance was found to be 9 feet. A project to dredge a cut 100 feet wide and 13 feet deep through the shoals southward of Sneads Point was approved August 13, 1892. Dredging commenced in June, 1893, and was stopped in September, resulting in a channel 81 feet wide and 12 to 13 feet deep. The channel was widened to 100 feet between September 17 and October 26, 1895. A survey was made in February, 1897, of the cut-off leading from Manatee River into Terraceia Bay. A project for improvement of the cut-off was approved June 23, 1897. Dredging was done at the cut-off from August to October, 1897, and from September, 1899, to April, 1900, resulting in a channel 2,840 feet long, 100 feet wide, and 6 feet deep.

The mouth of Manatee River is on the southern shore of Tampa Bay between the entrances to Sarasota and Terraceia bays. The river has the charactaristics of an estuary for a distance of 12 miles from its mouth. Thence it narrows rapidly and at Mitchellville, the head of navigation, is only 40 feet wide. From Ellenton and the mouth of Braidens Creek opposite Ellenton both banks of Manatee River have little towns along them that form almost continuous settlements. Across the bar at entrance to the river the depth is 9 feet. In the estuary the depth ranges from 6 to 28 feet. Above the estuary the depth varies from 1.5 to 14 feet.

There is now a navigable channel of 9 feet from Tampa Bay to Braidentown, 8 feet to Manatee, 7 feet to Ellenton, 6 feet to Rocky Bluff, and 1½ feet to Rye. The landing at Rye is 3 miles below Mitchellville, 10 miles above Ellenton, and 8.5 miles above Rocky Bluff.

When the original project for improvement of Manatee channel was adopted the conditions were quite different from what they now are. The nearest railroad was at Cedar Keys which was also the nearest port of call of the Gulf steamship lines. Consequently a channel that would permit sea-going vessels to enter the river would have been of great benefit to commerce. But since then railroad lines have entered Tampa and steamship lines have made it their terminus. The wants of the small towns along the Manatee River bank are supplied by light-draft steamers making daily trips from Tampa. Recently the Seaboard Air Line Railway has built a branch line from Turkey Creek to Palmetto on the right bank of the Manatee, and trains have been running for the past four months. Existing depths in the channel as far as Palmetto and Braidentown are ample to meet the needs of commerce. A deeper channel can not be maintained at mouth of the river without deflecting works, for the tidal and prevailing drift currents set across the direction the channel must of necessity be dredged. A survey in December, 1887, showed that the channel dredged there in 1883–4 was obliterated. Present commerce requires a channel of 9 feet depth as far as Rocky Bluff, and 4 feet depth to Rye. A fuller's earth refinery has just been established (and is now in operation) at Rocky Bluff, and will ship out 15,000 tons per year. Just above the refinery, about one-quarter of a mile, is Belk, that ships out 1,329 tons of fruit, vegetables, and naval stores, and received 298 tons of general merchandise yearly. Between Rocky Bluff and Rye the shipments by steamer and schooners aggregate 4,800 tons yearly.

The commerce of Manatee River has been of rapid growth. Particularly has this been the case during the past few years. The severe cold during winter of 1894–95, caused such slight injury to fruits and vegetables as compared with the damage throughout the State north of the Manatee section that the result has been a great impetus to citrus fruit and vegetable growing there. The commercial statistics giving the total tons transported in the Manatee River for a number of years are as follows:

	Tons.
1889	5, 699
1896	11, 552
1897	23, 800
1899	43, 542
1901	52, 618

Value of the freight hauled by water during the year 1901 is twenty times greater than the freight value in 1882 before any improvement of the channel had been made.

Below is a statement in detail of the commercial statistics of Manatee River for the twelve months ending June 30, 1902:

	Tons.
Inbound:	
General merchandise	10, 569
Grain	3, 125
Fertilizer	4, 500
Hay	1, 900
Lumber and shingles	23, 369
Brick	330
Machinery	200
Oils	378
Outward bound:	
Oranges, grape fruit, and lemons	10, 820
Tomatoes, celery, eggplant, cabbage, etc	8, 991
Cattle	171
Hides	19
Fish	313
Oysters	6
Ice	386
Honey and sirup	4
Naval stores	1, 537

The sum of the inbound and outward bound freight gives a total commerce by water of 66,618 tons.

The channel desired by the people in the Manatee section is 20 feet to Palmetto and Braidentown, 13 feet to Rocky Bluff, and 5 feet to Rye. The cost of such improvement would be enormous and unwarranted by the present or prospective commerce of the river. To reach the 20-foot contour in Tampa Bay from the mouth of the river would require a dredged channel 5 miles long. The deepest draft boat that is likely to engage in the river trade is 8 feet for the lower section of the river and 3.5 feet for the section above Rocky Bluff.

To prepare estimates and plans for improvement of the channel a detailed survey of seven shoals would be necessary. Four of these shoals are between Braidentown and Rocky Bluff and three above the latter place. I estimate the cost of survey at $1,000.

Very respectfully,

W. H. Caldwell,
Assistant Engineer.

Capt. Herbert Deakyne,
Corps of Engineers, U. S. A.

SUPPLEMENTARY REPORT ON PRELIMINARY EXAMINATION.

UNITED STATES ENGINEER OFFICE,
Tampa, Fla., December 16, 1902.

GENERAL: In compliance with Department letter of November 17, 1902, I have the honor to submit the following report on a preliminary survey of Manatee River, with a tentative estimate of the cost of improving the river to the extent indicated in my report dated August 19, 1902, on preliminary examination of the river.

In the report of August 19 I stated that to give the necessary facilities for commerce there should be a channel 9 feet deep as far up the river as Rocky Bluff and 4 feet deep thence to Rye. To form this channel it is necessary to remove seven shoals.

The money allotted for the preliminary survey was not sufficient to cover a survey of all these shoals. Borings were taken on all of them and a survey was made of the three on which the depth is least. The borings show that no rock will be encountered in dredging to the proposed depths. The material to be removed is sand, mud, clay, and shell.

The unit prices for this work should be large, for the reason that the work is in several small portions and the total is not large enough to justify any large expenditure for plant. Dividing the work into two parts, the estimate is as follows:

To form a channel 9 feet deep at mean low water to Rocky Bluff:		
Dredging 99,800 cubic yards, at 40 cents	$39,920.00	
Contingencies	5,988.00	
		$45,908.00
To form a channel 4 feet deep at mean low water from Rocky Bluff to Rye:		
Dredging 16,960 cubic yards, at 40 cents	6,784.00	
Contingencies	1,017.60	
		7,801.60
Total		53,709.60

The fuller's earth refinery at Rocky Bluff is in operation and has an output of 43 to 45 tons per day. This material is hauled by wagon to the railroad and thence shipped to Philadelphia by rail. A channel 9 feet deep to Rocky Bluff would enable this material to be shipped the whole distance by water at a saving estimated at from $2 to $3 per ton. For an annual output of 12,000 tons the saving on this one item of commerce would be more than large enough to justify the improvement.

Between Rocky Bluff and Rye the commerce consists chiefly of fruit, vegetables, naval stores, and general merchandise, amounting to about 5,000 tons yearly. This commerce is carried on with launches and various other small craft. A channel 4 feet deep would enable a small steamer to handle this freight at a considerable reduction from present cost.

For the reasons given above I consider Manatee River worthy of improvement to the extent of a channel at mean low water 9 feet deep from the mouth of the river to Rocky Bluff, and 4 feet deep from Rocky Bluff to Rye.

Attention is invited to the report,[a] dated December 12, 1902, of Mr.

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[a] Not printed.

W. H. Caldwell, assistant engineer, who made the preliminary survey on December 2 to 7, 1902.

Very respectfully, your obedient servant,

HERBERT DEAKYNE,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

U. S. ENGINEER OFFICE,
Baltimore, Md., December 19, 1902.

Respectfully submitted to the Chief of Engineers, United States Army.

The estimated saving of from $2 to $3 per ton in shipments of fuller's earth seems rather high, but the total cost of the improvement is not large, in view of which the improvement is, in my opinion, justified.

PETER C. HAINS,
Colonel, Corps of Engineers,
Division Engineer, Southeast Division.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., February 12, 1903.

GENERAL: In returning to the Chief of Engineers the reports of Capt. Herbert Deakyne, Corps of Engineers, on the preliminary examination of Manatee River, Florida, from mouth to Ellenton, thence to Rye, the Board of Engineers for Rivers and Harbors has the honor to submit the following report:

The Board has fully considered the reports of the district officer, various communications from interested persons bearing upon commercial statistics and the necessity for the improvement, and has by a committee made a personal inspection of the locality and conferred with members of the boards of trade of the villages of Palmetto, Braidentown, and Manatee, situated on the Manatee River.

The present project for the improvement of the Manatee River is to provide a channel 100 feet wide and 13 feet deep from Tampa Bay to Shaw and McNeills points. The district officer recommends a further improvement of this river at an estimated cost of $53,709.60, and the division engineer concurs in this recommendation.

The Board is of the opinion that the improvement of Manatee River by the General Government is desirable, and concurs in the recommendations of the district and division engineers that a channel be provided 100 feet wide and 9 feet deep from McNeills Point to Rocky Bluff, and 75 feet wide and 4 feet deep from Rocky Bluff to Rye.

In considering this case the Board has had in view the amount and character of commerce existing or reasonably prospective which will be benefited by the improvement, and is of the opinion that the public commercial interests involved are sufficient to justify the continuance and extension of the improvement of this river by the General Government. A brief memorandum of the facts in the case is inclosed herewith.

Respectfully submitted.

A. MACKENZIE,
Colonel, Corps of Engineers.
H. F. HODGES,
Major, Corps of Engineers.
EDW. BURR,
Captain, Corps of Engineers.
C. H. MCKINSTRY,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

MEMORANDUM ACCOMPANYING REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

Preliminary examination ordered by river and harbor act of June 13, 1902, made by Capt. Herbert Deakyne, Corps of Engineers; report favorable. Extended at request of Board, to obtain further data. Additional report with estimate of cost submitted December 16, 1902.

Locality visited by committee of Board, January, 1903.

Preliminary examination 1882; favorable report. Project adopted 1882; channel 100 feet wide, 13 feet deep, from Tampa Bay to Shaw and McNeills points. Modified 1888, to give depth of 9 feet to Manatee. In 1892 project of 1882 readopted. Further modified 1896, to include improvement of cut-off into Terraceia Bay. Nine appropriations, 1882–1899, $57,056.37. Amount expended to June 30, 1902, $57,000.

The improvement now contemplated would be an extension of former projects.

Commerce consists of agricultural products, fertilizers, lumber, fuller's earth, general merchandise, and particularly citrus fruits and vegetables.

Commercial statistics previously reported.

Year.	Tons.	Year.	Tons.
1893	6,872	1897	23,800
1894	11,552	1898	24,310
1895	11,718	1899	43,542
1896	21,000	1900	55,162

	Tons.	Value.
June 30, 1901, to June 30, 1902:		
Fruits and vegetables, 740,000 boxes	29,600	$1,480,000
Merchandise and miscellaneous	81,000	832,000
Total	110,600	2,313,000
Reasonably prospective commerce:		
1,000,000 boxes fruits and vegetables	40,000	2,000,000
Merchandise and miscellaneous	100,000	1,020,000
Total	140,000	3,020,000

Board recommends channel 9 feet deep, 100 feet wide, to Ellenton, and 4 feet deep and 75 feet wide to Rye, as recommended by district officer and division engineer.

Estimated cost of project, $53,709.60, is about 48 cents per ton, or about 2 per cent of the value of the present yearly commerce.

P 23.

MODIFICATION OF HARBOR LINES ALONG ST. JOHNS RIVER, NEAR JACKSONVILLE, FLORIDA.

[Thompson & Slater, attorneys for railroad companies before the Executive Departments.]

WASHINGTON, D. C., *February 26, 1904.*

SIR: We have the honor to hand you herewith blue print copies[a], in triplicate, showing the St. Johns River, Florida, 1 mile above and one-half mile below the contemplated improvements of the Atlantic Coast Line Railroad Company at East Jacksonville, Fla. The broken white line shows the present harbor line. The red line shows where the said railroad company desires to have a new harbor line established. It is believed that such a change in the harbor line will be beneficial to all concerned. The company does not and will not ask the Government to do any dredging or make any improvement within the proposed harbor line in front of its property, as shown on this chart or blue print.

The other blue print, in triplicate, shows the proposed improvements within the proposed harbor lines, consisting of piers and slips for vessels.

The plan of piers with cross sections of same shows in detail, especially, where piles or other permanent work is to be done.

We have to respectfully request the change in the harbor lines be made in accordance with the blue print, and the approval for piers and improvements at East Jacksonville, as shown by the blue prints.

Very respectfully,

THOMPSON & SLATER,
Attorneys, Atlantic Coast Line Railroad.

Gen. A. MACKENZIE,
Chief of Engineers, War Department.

[First indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, February 29, 1904.

Respectfully referred to Capt. F. R. Shunk, Corps of Engineers, for report.

To be returned.

By command of Brig. Gen. A. Mackenzie:

H. F. HODGES,
Major, Corps of Engineers.

[Second indorsement.]

U. S. ENGINEER OFFICE,
Jacksonville, Fla., March 7, 1904.

Respectfully returned to the Chief of Engineers, United States Army, with report of even date.

FRANCIS R. SHUNK,
Captain, Corps of Engineers.

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[a] Not printed.

[Third indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, March 18, 1904.

Respectfully returned to Captain Shunk, with request that the modified lines recommended be indicated on a tracing, that the bearings and distances be verified, and that a passage be left at the mouth of Deer Creek as at present, attention in this connection being invited to the accompanying memorandum.[a]

To be returned.

By command of Brig. Gen. A. Mackenzie:

H. F. Hodges,
Major, Corps of Engineers.

[Fourth indorsement.]

U. S. Engineer Office,
Jacksonville, Fla., March 24, 1904.

Respectfully returned to the Chief of Engineers, United States Army, with additional report of even date.

Francis R. Shunk,
Captain, Corps of Engineers.

[Fifth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, April 5, 1904.

Respectfully submitted to the Secretary of War.

Request is made in behalf of the Atlantic Coast Line Railroad Company for a modification of the established harbor line on the St. Johns River near Jacksonville, Fla., at a point where certain improvements are contemplated by said company.

The matter has been referred to the local engineer officer, Capt. Francis R. Shunk, Corps of Engineers, who expresses the opinion in report of March 7, 1904 (herewith), that the proposed change is more likely to be beneficial than otherwise, so far as navigation interests are concerned, and recommends that the modification be made as requested.

Concurring in the views of the local officer, I recommend that the modified pierhead line, delineated on the accompanying tracing[a] and described in a separate paper, herewith, be approved by the Secretary of War, and that the Secretary indicate his approval on the chart and description, both of which have been prepared for his signature.

* * * * * * *

A. Mackenzie,
Brig. Gen., Chief of Engineers, U. S. Army.

REPORTS OF CAPT. FRANCIS R. SHUNK, CORPS OF ENGINEERS.

United States Engineer Office,
Jacksonville, Fla., March 7, 1904.

General: In compliance with first indorsement on letter of Messrs. Thompson & Slater, attorneys for the Atlantic Coast Line Railroad, dated February 26, 1904, requesting a change in the harbor line of the St. Johns River in the vicinity of Jacksonville, Fla., I have the honor to submit the following report:

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[a] Not printed.

The St. Johns River at this point has ample width. The main channel is about one-half mile from the pierhead line proposed by the railway company. It is believed that the proposed change is more likely to be beneficial than otherwise.

It is recommended that the change in the pierhead line (designated "harbor line" in the communication herewith) be made as requested. The following change in the description of the pierhead line as established will be necessary.

The last paragraph in the detailed description of the pierhead and bulkhead lines for the St. Johns River at and in the vicinity of Jacksonville, Fla., approved by the Secretary of War July 22, 1902, reads as follows:

"*Pierhead lines—Left bank—Sheet No. 2.*"

[See description of modified line in the following letter.]

* * * * * * *

Very respectfully, your obedient servant,

FRANCIS R. SHUNK,
Captain, Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

UNITED STATES ENGINEER OFFICE,
Jacksonville, Fla., March 24, 1904.

GENERAL: In compliance with Department indorsement of March 18, 1904, on letter of Thompson & Slater, attorneys for the Atlantic Coast Line Railroad, I have the honor to forward (in separate roll) a tracing[a] showing the modified pierhead line recommended.

A passage 85 feet in width at the mouth of Deer Creek has been provided for and the bearings and distances of the proposed new lines verified. The substituted paragraph given in my letter of March 7, 1904, will now read as follows:

DESCRIPTION OF MODIFIED LINE.

Commencing at the last-described point on the pierhead line for the left bank, Sheet No. 1; thence S. 61° 56′ E. 2,040 feet; thence along a circular tangential arc of 3,230 feet radius (described from a center whence station Commodore bears S. 43° 53′ E. 2,720 feet, and station Ostrich bears N. 46° E. 2,880 feet) for a distance of 48° 53′; thence along a circular tangential arc of 2,070 feet radius (described from a center whence station Commodore bears S. 59° 13′ E. 1,715 feet, and station Hardee bears S. 49° 42′ W. 2,140 feet) for a distance of 60° 35′; thence N. 8° 19′ E. 2,500 feet; thence N. 4° 48′ E. 3,537 feet; thence N. 24° 21′ E. 480 feet; thence in a straight line to point 44 of the bulkhead line. Commencing again at point 43 of the bulkhead line: thence in a straight line to a point situated N. 24° 21′ E. 85 feet from the northernmost end of the last line described as N. 24° 21′ E. 480 feet; thence N. 24° 21′ E. 350 feet; thence N. 13° 30′ E. 4,640 feet; thence along a circular tangential arc of 5,175 feet radius (described from a center whence station Suarrez bears N.

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[a] Not printed.

64° 57′ E. 4,625 feet, and station Deer bears S. 42° 52′ E. 5,710 feet) for a distance of 63° 50′ to a point whence station Bank bears N. 67° E. 3,300 feet, and station Driggs bears S. 45° 15′ E. 6,090 feet.

Very respectfully, your obedient servant,

FRANCIS R. SHUNK,
Captain, Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

[First indorsement.]

WAR DEPARTMENT, *April 8, 1904.*

The within description of the modified pierhead line shown on tracing,[a] marked inclosure 57 of 39365 E. D., is approved.

ROBERT SHAW OLIVER,
Acting Secretary of War.

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[a] Not printed.

APPENDIX Q.

IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN GEORGIA AND FLORIDA AND IN EASTERN ALABAMA.

REPORT OF CAPT. J. B. CAVANAUGH, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Carrabelle Bar and Harbor, Florida.
2. Apalachicola Bay, Florida.
3. Apalachicola River, the Cut-off, and Lower Chipola River, Florida.
4. Upper Chipola River, Florida, from Marianna to its mouth.
5. Flint River, Georgia.
6. Chattahoochee River, Georgia, and Alabama.
7. Choctawatchee River, Florida and Alabama.
8. Lagrange Bayou, Florida, including Holmes River, Florida, from Vernon to its mouth.
9. Pensacola Harbor, Florida.
10. Escambia and Conecuh rivers, Florida and Alabama.
11. Alabama River, Alabama.
12. Coosa, Oostenaula and Coosawattee rivers, Georgia and Alabama.
13. Operating and care of canals and other works of navigation on Coosa River, Georgia and Alabama.
14. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS.

15. Blackwater and Upper East bays and Blackwater River, Florida.
16. St. Andrews Bay, Florida.

United States Engineer Office,
Montgomery, Ala., July 18, 1904.

General: I have the honor to forward herewith * * * annual reports of the river and harbor works under my charge * * * for the fiscal year ending June 30, 1904.

* * * * * * *

Very respectfully, your obedient servant,

J. B. Cavanaugh,
Captain, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

Q 1.

IMPROVEMENT OF EAST PASS CARRABELLE BAR AND HARBOR, FLORIDA.

A description of the locality, its original condition, the projects for improvement, the recommendations resulting from recent examinations and surveys, and the present condition of the channel across the bar at the river mouth and at East Pass are stated in the Annual Report of the Chief of Engineers for 1904, page 302.

Work done prior to June 30, 1900, will be found described on pages 2088–2089, Annual Report of the Chief of Engineers for 1900.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Proposals for dredging across East Pass were readvertised and opened on August 12, 1903. The only bid received was that made by Mr. Rittenhouse Moore, of Mobile, Ala., at 30 cents per cubic yard. This bid was accepted and contract entered into for the completion of the work by February 7, 1904. The time limit on this contract was waived to permit the contractor to complete other work, and due to loss of plant no work has yet been done; but it is now expected that dredging will be commenced early in the coming fiscal year.

On June 25, 1904, an allotment of $7,500 was made from the appropriation for emergencies in river and harbor works, act of June 13, 1902, for redredging the channel across the bar at the mouth of the Carrabelle River.

RECOMMENDATIONS AND ESTIMATES.

The completion of work upon the bar at the river mouth and the deepening of East Pass are important to both present and prospective commerce. The vessels now touching at Carrabelle and the tugs used in lightering between Carrabelle and St. George anchorage find the narrow, shallow channel very difficult of navigation, and relief is badly needed. The increased depth of water through East Pass will secure much better rates of freight and insurance for the commerce now using Carrabelle Harbor, and much better inducements will be offered to prospective commerce. I am informed that better railroad facilities have recently been secured, and that, due to these facilities and the very favorable railroad rates that have been offered, a largely increased commerce will follow the improvement of the harbor and channel.

The channel across the bar at the mouth of the river should, therefore, be completed to the depth of 10 feet, with a width of 100 feet throughout, and East Pass should be deepened to 20½ feet, as contemplated in the approved project.

It is proposed to expend the balance available in redredging the channel across the bar at the mouth of Carrabelle River, and dredging the channel at East Pass, the work to be done by contract, and to apply the additional appropriation recommended to deepening East Pass and closing an opening on Dog Island, and to dredging a channel 10 feet deep across the bar at the mouth of the Carrabelle River.

Money statement.

July 1, 1903, balance unexpended	$19,727.14
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	7,500.00
	27,227.14
June 30, 1904, amount expended during fiscal year for maintenance of improvement	422.60
July 1, 1904, balance unexpended	26,804.54
July 1, 1904, outstanding liabilities	18,000.30
July 1, 1904, balance available	8,804.24
July 1, 1904, amount covered by uncompleted contracts	18,000.00
Amount (estimated) required for completion of existing project	54,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	54,750.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

June 3, 1896	$10,000.00
March 3, 1899	10,000.00
June 6, 1900 (allotment)	1,704.08
June 13, 1902	20,000.00
June 13, 1902 (allotment made June 25, 1904)	7,500.00
Total	49,204.08

COMMERCIAL STATISTICS FOR PORT OF CARRABELLE, FLA., FROM JULY 1, 1903, TO JUNE 30, 1904.

Exports to foreign ports	$96,362
Exports to coastwise ports	119,310
Total	215,672

	Number.	Tons.
Vessels entered from—		
Foreign ports	34	17,643
Coastwise ports	7	4,151
Total	41	21,794
Vessels cleared for—		
Foreign ports	20	8,232
Coastwise ports	17	8,894
Total	37	17,126
Steam vessels employed in traffic of port	6	237
Sail vessels employed in traffic of port	5	40
Total	11	277

Freight carried.

Articles.	Quantity.	Value.
Lumber and timber ....feet..	13,406,000	$207,772.00
Rosin ....barrels..	3,950	7,900.00
Total value	....	215,672.00

Q 2.

IMPROVEMENT OF HARBOR AT APALACHICOLA BAY, FLORIDA.

A description of this locality, its original and present conditions, and the project for improvement are given in the Annual Report of the Chief of Engineers for 1904, page 303.

Work done prior to June 30, 1903, is described in the Annual Reports of the Chief of Engineers for 1900, pages 2092–2095, and 1903, pages 1209–1210.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Proposals for dredging across the sea bar at West Pass entrance to Apalachicola Bay and the Link channel were readvertised and were opened on August 12, 1903. The only bid received was that made by Mr. Rittenhouse Moore, of Mobile, Ala., at 30 cents per cubic yard. This bid was accepted and contract entered into for the completion of the work by February 7, 1904. The time limit on contract was waived to permit the contractor to complete other work, and due to loss of plant no work has yet been done, but it is now expected that dredging will be commenced early in the coming fiscal year.

On May 31, 1904, an allotment of $12,500 was made from the river and harbor act of April 28, 1904, for redredging the channel across the bar at the mouth of the Apalachicola River, and a project has been submitted for the execution of this work by contract.

RECOMMENDATIONS AND ESTIMATES.

The importance of a deep-water harbor in this vicinity can not be overestimated, and as a great system of navigable rivers has its outlet at Apalachicola Bay this improvement is entitled to special consideration. To secure permanent and satisfactory results it is necessary that the full amount necessary for the completion of the project within two years be made available under the continuing contract system, and that the channel then be properly maintained.

The appropriations thus far made have been insufficient and have all been practically absorbed in maintenance, the work accomplished on the adopted project not exceeding $20,000 in amount.

It is proposed to expend the balance available in redredging the channel across the bar at West Pass entrance to Apalachicola Bay and Link channel, and across the bar at the mouth of Apalachicola River, and to apply the additional appropriation recommended to completion of the present project and to maintenance of the channel.

Money statement.

July 1, 1903, balance unexpended		$19,556.45
Amounted allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904		12,500.00
		32,056.45
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		156.60
July 1, 1904, balance unexpended		31,899.85
July 1, 1904, outstanding liabilities		18,000.30
July 1, 1904, balance available		13,899.55
July 1, 1904, amounted covered by uncompleted contracts		18,000.00
Amount (estimated) required for completion of existing project		330,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$165,000.00	
For maintenance of improvement	20,000.00	
		185,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

March 2, 1833	$8,700	
July 4, 1836	10,000	
March 3, 1839	9,900	
		$28,600
June 14, 1880	10,000	
March 3, 1881	10,000	
August 2, 1882	25,000	
July 5, 1884	10,000	
August 5, 1886	12,000	
August 11, 1888	20,000	
September 19, 1890	20,000	
July 13, 1892	20,000	
August 18, 1894	15,000	
June 3, 1896	12,000	
		154,000
March 3, 1899	20,000	
June 13, 1902	40,000	
April 28, 1904 (allotment)	12,500	
		72,500
Total		255,100

COMMERCIAL STATISTICS FOR PORT OF APALACHICOLA, FLA., FROM JULY 1, 1903, TO JUNE 30, 1904.

Exports to foreign ports	$213,428
Exports to coastwise ports	307,013
Total	520,441

	Number.	Tons.
Vessels entered from foreign ports	46	24,638
Vessels entered from coastwise ports	15	8,910
Total	61	33,548
Vessels cleared for foreign ports	34	18,788
Vessels cleared for coastwise ports	38	20,811
Total	72	39,599

Freight carried in domestic and foreign trade.

Articles.		Quantity.	Value.
Lumber	feet	33,331,000	$512,542
Rosin	barrels	3,950	7,900
Total value			520,442

The figures given above do not include anything shipped or received by vessels which do not enter and clear at the custom-house.

Q 3.

IMPROVEMENT OF APALACHICOLA RIVER, THE CUT-OFF, AND LOWER CHIPOLA RIVER, FLORIDA.

Description of this river, statement of project for its improvement, and facts concerning its original and present conditions are given in Annual Report of the Chief of Engineers for 1904, page 305.

A complete synopsis of work done upon the river from January 1, 1875, to June 30, 1895, may be found in Annual Report of the Chief of Engineers for 1896, pages 1348–1350. Work from June 30, 1895, to June 30, 1903, is described in Annual Reports of the Chief of Engineers for 1900, pages 2096–2097; for 1901, pages 1769–1771, and for 1903, page 1212.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

The snag boat *Flint* and the dipper dredge belonging to the river were employed on this stream during a part of the low-water season, and the following work was done:

SNAG BOAT.

Overhanging trees removed	4,536
Overhanging trees trimmed	20
Snags removed from river	887
Logs removed from river	71
Stumps removed from river	441

Total cost of $2,597.22.

DREDGE.

24,453 cubic yards of mud, sand, and gravel were dredged, at a cost of $1,560.54, or approximately 0.064 cent per cubic yard.

The result of this work has been to keep the Apalachicola River free from obstructions and to widen and thus materially improve the channel through Lees Slough so that steamers can now use the channel through the Cut-off, Lees Slough, and lower Chipola River upstream as well as on the down trip. No increase in depth has been secured but Lees Slough has been widened to at least 60 feet.

RECOMMENDATIONS AND ESTIMATES.

The Apalachicola River requires the removal of the annual accumulation of logs, snags, and overhanging trees and the deepening of the channel across the bar at Blountstown. The Cut-off, Lees Slough, and lower Chipola River require the removal of obstructions and dredging, particularly at the sharp bends and narrow places, as it is thought that the slough will eventually become the main river. As there are no important landings on the old river in this section it would be advisable to aid this change.

On May 31, 1904, an allotment of $3,750 was made from the appropriation for emergencies in rivers and harbors, act of June 13, 1902, for the restoration and maintenance of this improvement.

It is proposed to apply the available funds to the maintenance of the improvement and the additional funds recommended to the removal of obstructions and to dredging at Blountstown and in the Cut-off, Lees Slough, and lower Chipola River.

Money statement.

July 1, 1903, balance unexpended		$4,157.76
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902		3,750.00
		7,907.76
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		4,157.76
July 1, 1904, balance unexpended		3,750.00
Amount (estimated) required for completion of existing project		15,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$15,000.00	
For maintenance of improvement	5,000.00	
		20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harber act of 1899.		

APPROPRIATIONS.

May 23, 1828	$3,000
April 23, 1830	2,000
March 2, 1831	8,000
June 23, 1874	10,000
March 3, 1875	10,000
June 18, 1878	8,000
March 3, 1879	5,000
June 14, 1880	2,000
March 3, 1881	1,500
August 2, 1882	2,000
July 5, 1884	1,000
August 5, 1886	1,000
August 11, 1888	2,000
September 19, 1890	$2,000
July 13, 1892	5,000
August 18, 1894	5,000
June 3, 1896	5,000
March 3, 1899	3,000
June 6, 1900 (allotment from emergency act)	1,500
June 13, 1902	6,000
June 13, 1902 (allotment made May 31, 1904)	3,750
Total	86,750

COMMERCIAL STATISTICS.

The commerce interested on this river is chiefly cotton, naval stores, general merchandise, saw logs, and timber for export. This river runs through a section of country where there are no railroads, and the country bordering upon it depends largely on the steamboats for transportation of products and supplies. There is also a large passenger traffic on the river.

Reference is made to reports on the Flint and upper Chipola rivers for detailed statistics.

Q 4.

IMPROVEMENT OF UPPER CHIPOLA RIVER, FLORIDA, FROM MARIANNA TO ITS MOUTH.

Description of this river and statements of its past and present conditions and of the project are given in the Annual Report of the Chief of Engineers for 1904, page 307.

The work done is described on pages 2099–2100, Annual Report of the Chief of Engineers for 1900.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Operations during the year have been confined to the Dead Lakes, in which there is ample depth of water, but many cypress knees and stumps, logs, and other obstructions. A snag boat was borrowed from the Flint River improvement and a channel having a minimum width of 60 feet was cleared for a distance of 7 miles from the lower end of Dead Lakes. The cypress knees and stumps were blasted with dynamite, and where necessary to secure 6 or 7 feet of water over them they were also removed from the channel by the snag boat.

The work done was as follows:

Overhanging trees removed	38
Overhanging trees trimmed	45
Snags removed	607
Logs removed	146
Stumps removed	451

At a total cost of $2,000.

RECOMMENDATIONS AND ESTIMATES.

It is recommended that further work upon this waterway be confined to the removal of snags, logs, overhanging trees, and cypress trees and stumps between "Look and Tremble" shoal and the foot of the Dead Lakes at the lower Chipola River, and to dredging a channel through the mud bar at Sister Islands. This work will open up a waterway from the Apalachicola River system to "Look and Tremble" shoal, about 45 miles below Marianna. To extend the improvement farther would require the construction of at least one lock and dam and very expensive channel work over rock shoals, therefore no further work than above outlined is recommended, as the river has already been cleaned of snags above "Look and Tremble" shoal, and in high stages barges can bring down freight from Marianna to the shoal and then transfer it.

It is proposed to expend the funds recommended in removing the logs, snags, and overhanging trees, blasting out cypress stumps and knees from the channel through the Dead Lakes and up the Chipola

River to "Look and Tremble" shoal, when high water on the Flint River makes the necessary plant available, and to dredging a channel through the bar at Sister Islands.

Money statement.

July 1, 1903, balance unexpended	$2,000.00
June 30, 1904, amount expended during fiscal year, for works of improvement	2,000.00
Amount (estimated) required for completion of existing project	34,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	6,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

March 3, 1899	$5,000
June 13, 1902	2,000
Total	7,000

COMMERCIAL STATISTICS.

Statement of business done during the past fiscal year on the upper Chipola River and Dead Lakes, Florida, by the Chipola Barge Company.

Name and description.	Registered tonnage.	Draft.		Number of round trips, and between what places.	Passengers.
		Light.	Loaded.		
		Feet.	*Feet.*		
Little Belle (tug and barges)	2	3½	4	140, mouth Dead Lakes and steel bridge.	....
Annie M. (tug and barges)	13	3	3	.....do	200

Freight carried.

Articles.		Quantity.	Tons.
Cotton-seed meal	sacks	3,000	150
Fertilizers	do	1,000	100
Oats	do	1,600	80
Corn	do	1,000	50
Hay	bales	2,000	100
Wool	do	100	5
Rosin	barrels	12,000	3,000
Turpentine	do	4,000	1,000
Flour	do	800	80
Sugar	do	50	8
Molasses	do	50	8
Ties	bundles	2,000	25
General merchandise	packages	200	20
Lumber	feet	50,000	100
Staves	pieces	2,000	20
Provisions (case goods)	packages	2,000	100
Coffee	sacks	25	2
Corn meal	do	1,000	50
Bacon, smoked and dressed shoulder	boxes	120	20
Salt	sacks	120	12
Lard	packages	1,000	50
Soap	boxes	1,000	50
Nails	kegs	100	5
Shingles	number	20,000	50
Brick	do	10,000	25
Total		....	5,110

Estimated value of above freights, $510,000.

Q 5.

IMPROVEMENT OF FLINT RIVER, GEORGIA.

For previous history, statements of project, and present conditions, see Annual Report of the Chief of Engineers for 1904, page 308.

For a detailed account of past operations, see Annual Reports of the Chief of Engineers for 1900, pages 2102–2103; 1901, pages 1773–1775, and 1903, page 1215.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Under contract with the M. A. Sweeney Shipyard and Foundry Company, of Jeffersonville, Ind., a snag boat 75 by 26 by 4 feet 9 inches, provided with steam capstans, was completed and delivered. The drilling barge worked between Albany and Bainbridge throughout the low-water season, widening and deepening the channels through rock reefs and removing isolated bowlders. At Rope Walk shoals and Bull Slough, two of the worst obstructions, the channel was widened to 60 feet and made 3 feet deep, and a similar improvement was in progress at Ferguson's shoals when work was suspended for the season.

The following statement shows the locations and extent of work done:

Rock excavation.	Quantity.	Cost.
	Cub. yds.	
Rope Walk shoals	808	$1,018.39
Bull Slough	451	547.93
Dry Bread shoals	80	99.23
Hopkins obstructions	90	104.24
Humphrey's shoals	66	73.20
Sycamore shoals	105	135.28
Flat Rock	38	52.44
Sycamore Rock	349	482.64
Jumping Gully	12	19.08
Griffin's pocket	12	19.08
Ferguson's shoals	441	693.26
Total	2,452	3,244.77

Average cost of rock excavation per cubic yard was, approximately, $1.32.

On June 13, 1904, work was commenced at Ferguson's shoals and during the remainder of the month 201 cubic yards of rock were removed.

RECOMMENDATIONS AND ESTIMATES.

It is recommended that for the present work be confined to the river below Albany, and include the enlargement of channels through rock reefs and the removal of bowlders between Albany and Bainbridge; the removal of isolated bowlders below Bainbridge, and such snagging operations as may be required for maintenance.

For rapid and economical work a suitable dipper dredge is required in connection with the drilling barge for removing the blasted rock, and as none is available one should be constructed.

It is proposed to expend the funds now on hand in continuing work with the drilling barge between Albany and Bainbridge, and to apply the funds recommended as follows:

Removing bowlders below Bainbridge	$4,000
Construction of dredge	10,000
Channel work between Bainbridge and Albany	15,000
For maintenance, snagging, etc	1,000
Total	30,000

Money statement.

July 1, 1903, balance unexpended		$21,028.62
June 30, 1904, amount expended during fiscal year, for works of improvement		14,469.96
July 1, 1904, balance unexpended		6,558.66
July 1, 1904, outstanding liabilities		658.21
July 1, 1904, balance available		5,900.45
Amount (estimated) required for completion of existing project		92,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$29,000.00	
For maintenance of improvement	1,000.00	
		30,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

June 23, 1874	$18,000	August 11, 1888	$20,000
March 3, 1875		September 19, 1890	20,000
August 14, 1876		July 13, 1892	15,000
June 18, 1878	10,000	August 18, 1894	8,000
March 3, 1879	7,000	June 3, 1896	8,000
June 14, 1880	20,000	March 3, 1899	5,000
March 3, 1881	15,000	June 13, 1902	25,000
August 2, 1882	25,000		
July 5, 1884	20,000	Total	236,000
August 5, 1886	20,000		

COMMERCIAL STATISTICS.

The commerce of this stream is principally cotton, naval stores, and lumber. There are great quantities of fine timber along the banks of the river, mainly pine, cypress, and hard wood.

When the river is made navigable from Albany to Bainbridge the entire year it will greatly benefit these industries and new ones will spring up along the river.

Statement of business done by steamboats on the Flint River, Georgia, compiled from information furnished by the officers of the Thronateeska Navigation Company.

Stern-wheel steamboats.	Registered tonnage.	Draft.		Round trips.	Between—	Passengers.
		Light.	Loaded.			
		Inches.	*Inches.*			
Jno. R. Sharpe	50	18	36	360	Bainbridge and Albany	1,000
Forrest	50	20	36	205	Bainbridge and Addison	
T. C. Drake	45	18	30	100	Bainbridge and Chattahoochee.	

Freight carried.

Articles.		Quantity.	Tons.
Cotton	bales	6,000	1,500
Cotton seed	sacks	36,000	2,250
Cotton-seed meal	do	20,000	1,000
Fertilizers	do	30,000	3,000
Oats	do	8,000	800
Corn	do	10,000	835
Hay	bales	20,000	1,000
Rosin	barrels	40,000	10,000
Turpentine	do	10,000	2,000
Flour	do	600	60
Sugar	do	300	43
Molasses	do	1,000	250
Bagging	rolls	2,600	62
Ties	bundles	2,000	25
General merchandise	do	10,000	1,000
Live stock	head	200	40
Lumber	feet	100,000	200
Staves	pieces	100,000	1,000
Provisions—case goods	packages	1,000	100
Coffee	sacks	100	9
Corn meal	do	2,000	100
Bacon, smoked and dry salted	boxes	1,200	200
Salt	sacks	1,000	100
Lard	packages	500	62
Soap	boxes	400	200
Nails	kegs	600	30
Shingles	number	400,000	200
Brick	do	100,000	250
Total			26,316

Estimated value of above freights (in round numbers), $1,315,800.

Between Bainbridge, Ga., and the mouth of the river the stream is used for the steamers plying the Chattahoochee and Apalachicola rivers, and for the commerce of this entire system reference is made to the following tables:

Stern-wheel steamboats.	Registered tonnage.	Draft.		Round trips.	Between—	Passengers.
		Light.	Loaded.			
		Inches.	*Inches.*			
M. W. Kelley	95	18	54	45	Columbus and Apalachicola.	3,435
Queen City	150	24	48	151	Bainbridge and Apalachicola.	15,425
W. C. Bradley	175	20	48	49	Columbus and Apalachicola.	3,715
Three States	126	18	48	6	do	330
J. W. Hires	125	20	48		Laid up	
Eunola	80	20	48	16	Alaga, Ala., and Wewahitchka, Fla.	

Freight carried.

Articles.		Quantity.	Tons.
Cotton	bales	9,862	2,465
Cotton seed	sacks	39,690	3,050
Cotton-seed meal	do	15,615	782
Fertilizers	do	42,425	4,243
Grain	do	27,905	2,790
Hay	bales	200	10
Rosin	barrels	42,265	10,566
Turpentine	do	13,230	3,307
Flour	do	165	16
Sugar	do	25	5
Molasses and honey	do	6,535	1,634
Bagging	rolls	300	15
Ties	bundles	200	5
General miscellaneous	packages	202,190	35,383
Hides and skins	do	150	8
Live stock	head	232	116
Lumber	feet	1,132,500	2,265

Freight carried—Continued.

Articles.	Quantity.	Tons.
Provisions—case goods....packages..	220,295	22,030
Coffee ....sacks..	10	1
Corn meal....do....	450	27
Bacon, smoked and dry salted ....boxes..	20	5
Lard....packages..	10	1
Soap ....boxes..	20	1
Shingles ....number..	5,683,000	17,050
Brick....do....	610,000	1,525
Total....	....	107,300

Estimated value of above freights (in round numbers), $10,480,000.

In addition to the above, large quantities of timber are carried down these streams to sawmills at Apalachicola and Carrabelle, Fla., of which no value is given, as there seems to be some difficulty in keeping a record of the amount of timber rafted down, but its value is included in the general value of the commerce reported for Apalachicola and Carrabelle, Fla.

Q 6.

IMPROVEMENT OF CHATTAHOOCHEE RIVER, GEORGIA AND ALABAMA.

For descriptions and statements of project see Annual Report of the Chief of Engineers for 1904, page 309. For detailed statements of past operations see Annual Reports of the Chief of Engineers as follows: 1898, pages 1388–1390; 1900, pages 2107–2108; 1901, pages 1775–1777; 1902, pages 1263–1264; 1903, pages 1218–1219.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

During the year the river was kept free from snags, this work being confined almost entirely to the section between Columbus and Eufaula. At Jennys Island and Abercrombie's bar, channels 100 feet wide and 4 feet deep were dug with the dipper dredge and kept open throughout the low-water season, all dredged material being piled alongside cuts. At the beginning of the present low-water season these channels had shoaled to 3 feet. In the Town reach, 3 miles long, between Columbus and Mary Freeman's bar, a system of jetties was partially constructed, two-thirds of the reach being completed. The jetties, about 160 feet long, 5 feet wide, and 2 feet above low water, spaced 600 feet apart, are constructed of two lines of round piles 5 feet apart, filled with alternate layers of brush and stone. The piles in each row are spaced 6 feet center to center and are held together by a waling piece bolted to the tops of the piles, and the two rows of piling are held together by ties bolted to the waling strips. The piles were driven with a driver belonging to the improvement mounted on a hired barge; one of the snag boats and the two rock barges were employed in transporting materials for the jetties; the rock was quarried in the river bed below the falls at Columbus, and the brush was cut below Mary Freeman's bar. These jetties have maintained the channel in good condition, and when extended to Mary Freeman's bar will complete the improvement of Town reach.

The following is a detailed statement of the season's work:

Overhanging trees removed	902
Overhanging trees trimmed	64
Logs removed from river	29
Stumps on bank cut level	24
Snags removed from river	1,322

All at a cost of $1,476.54.

Dredging 35,928 cubic yards of sand and gravel, at a cost of $2,840.58, or approximately 0.079 cents per cubic yard.

Constructing 3,016 linear feet of jetty, at a cost of $13,791.04, or approximately $4.57 per linear foot.

Under contract with M. A. Sweeney Ship Yard and Foundry Company, of Jeffersonville, Ind., 2 dump scows, 1 barge with sand pump, and 1 towboat have been completed and delivered.

On May 31, 1904, an allotment was made from the funds appropriated by the river and harbor act of April 28, 1904, for the restoration and maintenance of this improvement.

RECOMMENDATIONS AND ESTIMATES.

In addition to work for which funds have already been provided, the following is of immediate importance and is recommended:

Works of regulation should be built at the following places where the river has excessive width, viz: Jennys Island, Mound bar, Abercrombie's bar, Woolfolks Bend, Slick Bluff, Shell Creek, Gunboat shoals, Francis Bend, and Smiths Bend; and in most of these places these works should be assisted by dredging; rock and marl reefs should be removed at Slick Bluff, Rock Island, King's rock, and other less important points.

The river should be maintained clear of snags and other similar obstructions at all times.

It is proposed to apply the available funds, including the allotment above mentioned, to repairing and extending the system of jetties in the Town reach, to repairing other works of regulation, to dredging at Jennys Island and Abercrombie's bar, and to such other work as may be necessary to keep the channel open.

It is proposed to apply the additional funds recommended as follows:

Construction of pile-driver barge	$2,000
Operating snag boats *Flint* and *Chattahoochee*	15,000
Operating dipper dredge	6,000
Operating suction dredge	6,000
Operating towboat	6,000
Repairs to works of contraction	10,000
Building additional works of contraction	60,000
Removing rock and marl reefs (drilling and blasting)	10,000
Repairs and care of plant	10,000
Total	125,000

Money statement.

July 1, 1903, balance unexpended		$73,950.82
Amount allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904		32,650.00
		106,600.82
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$13,791.04	
For maintenance of improvement	52,089.32	
		65,880.36
July 1, 1904, balance unexpended		40,720.46
July 1, 1904, outstanding liabilities		3,692.79
July 1, 1904, balance available		37,027.67
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$70,000.00	
For maintenance of improvement	55,000.00	
		125,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

February 24, 1835	$2,000.00	August 18, 1894	[b]$25,000.00
June 23, 1874	[a]52,000.00	June 3, 1896	[b]20,000.00
March 3, 1875		March 3, 1899	[b]45,000.00
August 14, 1876		June 13, 1902	100,000.00
June 18, 1878	18,000.00	Amount of unexpended balance transferred from appropriation for Chattahoochee River, between West Point and Franklin	280.78
March 3, 1879	15,000.00	April 28, 1904 (allotment made May 31, 1904)	32,650.00
June 4, 1880	20,000.00	Total	[c]489,930.78
March 3, 1881	20,000.00		
August 2, 1882	25,000.00		
July 5, 1884	35,000.00		
August 5, 1886	20,000.00		
August 11, 1888	20,000.00		
September 19, 1890	20,000.00		
July 13, 1892	20,000.00		

COMMERCIAL STATISTICS.

The commerce interested on this river is chiefly cotton, naval stores, and general merchandise. The river runs through a section of country where there are but few railroads (none parallel with the river), and the people depend largely on the boats for their supplies. There is also a large passenger traffic on the river.

The commercial statistics for the Chattahoochee River are so combined with those of the Flint and Apalachicola and upper Chipola rivers that a separation is impossible, and reference is made to report upon Flint and upper Chipola river improvements for detailed statistics.

Columbus, Ga., at the head of navigation, with its magnificent water power, is rapidly becoming one of the greatest manufacturing centers of the South, and, with the completion of the deep water harbor projected at the mouth of this system of rivers, the importance of this improvement will be greatly increased.

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[a] Allotted from appropriations aggregating $70,000 for improving Chattahoochee and Flint rivers.

[b] Does not include $5,000 allotted for expenditure between West Point and Franklin.

[c] Of this amount $2,000 (appropriation of February 24, 1835) was carried to the surplus fund.

Q 7.

IMPROVEMENT OF CHOCTAWHATCHEE RIVER, FLORIDA AND ALABAMA.

For description, statements of project, and original and present conditions, see Annual Report of the Chief of Engineers for 1904, page 311.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Between Newton, Ala., and Geneva, Ala., the snag boat *Choctawhatchee* worked over the river from Geneva to the foot of the marl shoals above Pates Landing, removing only such obstructions as actually interfered with navigation, as it was desired to carry the work as far up the river as possible.

The shoal water above Pates Landing seriously interfered with operations, and only work necessary to enable the snag boat to reach the foot of the shoals was done, as she was aground much of the time. From this point the improvement was extended about 3 miles farther upstream and a channel 40 feet wide and 3 feet deep excavated through 5 shoals and part of a sixth. In making these channels the marl was broken up by blasting, removed by hand, and placed in dams at the foot of the shoals to hold the water up on the shoals.

The work done was as follows:

Overhanging trees removed	636
Overhanging trees trimmed	150
Logs removed from bank	146
Stumps on bank cut level	36
Snags removed from river	737
Logs removed from river	77
Marl removed, cubic yards	252
Wood cut by party, cords	34
River worked over, miles	30

GENERAL IMPROVEMENT.

The channel through the bar at the mouth of the river (Cypress Top) was completed July 31, 1903, and in January, 1904, some repairs were made to bulkhead where damaged by a severe storm. This channel is 60 feet wide, 5½ feet deep, and about 1,200 feet long, with timber bulkheads on each side, which, together with methods of work, are described in the Report of the Chief of Engineers for 1903, page 1221.

The work done during the year was as follows:

Dredging, cubic yards	3,205
Bulkhead constructed, linear feet	800
Large cypress logs removed during dredging	5

Upon completion of the channel at Cypress Top the snag boat *Escambia* commenced work at the mouth of the river and removed obstructions as far as available funds permitted. When operations were suspended 53½ miles had been improved and the following work done:

Snags removed from river	285
Logs removed from river	918
Stumps on bank cut level	6
Overhanging trees removed	337
Wood cut by party, cords	31

At a total cost of $1,300.

RECOMMENDATIONS AND ESTIMATES.

The section of the river between Newton and Geneva is considered unworthy of improvement, and no further work upon it is recommended. Below Geneva the river should be kept clear of all obstructions to provide proper facilities for the growing commerce on this river and its tributary, the Holmes River. There are now four steamboats engaged in this commerce.

The channel across the bar at Cypress Top should be maintained and deepened to afford proper facilities for the tugs engaged in the large lumber trade of the river.

On May 31, 1904, an allotment of $3,000 was made from the appropriation for emergencies in river and harbor works, act of June 13, 1902, for maintenance, with which it is proposed to operate a snag boat during a part of the coming low-water season for the removal of obstructions from the river.

The additional funds recommended for appropriation are for the river below Geneva only, and it is proposed to apply them to removing obstructions from Geneva to the mouth and to maintaining and deepening the channel at Cypress Top.

Should Congress make any funds applicable to the section above Geneva, as has been done heretofore, the appropriation for the river should be increased by the amount so made available.

Money statements.

BETWEEN NEWTON AND GENEVA.

July 1, 1903, balance unexpended	$5,639.56
June 30, 1904, amount expended during fiscal year for maintenance of improvement	5,368.86
July 1, 1904, balance unexpended	270.70
July 1, 1904, outstanding liabilities	42.12
July 1, 1904, balance available	228.58

CYPRESS TOP OUTLET.

July 1, 1903, balance unexpended	$1,286.88
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1,286.88

GENERAL IMPROVEMENT.

July 1, 1903, balance unexpended	$2,000.00
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	3,000.00
	5,000.00
June 30, 1904, amount expended during fiscal year for maintenance of improvement	2,000.00
July 1, 1904, balance unexpended	3,000.00
Amount that can be profitably expended below Geneva in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	15,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

March 3, 1833	$5,000.00
June 15, 1844	10,000.00
June 25, 1874	5,000.00
March 3, 1875	5,000.00
August 4, 1876	5,000.00
March 3, 1879	5,000.00
June 14, 1880	7,000.00
March 3, 1881	10,000.00
August 2, 1882	[a]18,000.00
July 5, 1884	15,000.00
August 5, 1886	15,000.00
August 11, 1888	10,000.00
September 19, 1890	12,500.00
July 13, 1892	$12,500.00
August 18, 1894	6,000.00
June 3, 1896	5,000.00
March 3, 1899	16,000.00
June 13, 1902	16,000.00
June 13, 1902 (allotment made May 31, 1904)	3,000.00
Total	181,000.00
Carried to the surplus fund, 1852	2,123.38
Balance	178,876.62

COMMERCIAL STATISTICS.

The commerce of this stream is mainly saw logs, timber, naval stores, and general merchandise, the value of which for the fiscal year ending June 30, 1904, is estimated to be about $1,500,000.

Q 8.

IMPROVEMENT OF LAGRANGE BAYOU, FLORIDA, INCLUDING HOLMES RIVER, FLORIDA, FROM VERNON TO ITS MOUTH.

For descriptive statement of conditions and project see Annual Report of the Chief of Engineers for 1904, page 312.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

With the snagboat *Escambia* the river was cleared of obstructions from the mouth to Vernon, as well as available funds permitted, and at Winding Blades a channel 33 feet wide, 6 feet deep, and 30 feet long was cut across the point to avoid the sharp bend.

The work done was as follows:

Length of river worked over ... miles	25
Snags removed from river	408
Logs removed from river	507
Overhanging trees removed from river	322
Overhanging trees trimmed	41
Stumps on bank cut level	110
Bushes cut	1,165
Wood cut, cords	6

At a total cost of $2,070.

RECOMMENDATIONS AND ESTIMATES.

As a considerable commerce has sprung up on this stream between Vernon and Pensacola, it should be cleared of obstructions and maintained in this condition. The funds recommended are to be applied to this work.

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[a] Does not include $2,000 allotted for expenditure on Holmes River.

Money statement.

July 1, 1903, balance unexpended	$2,070.20
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	2,070.20
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	4,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

August 2, 1882	[a]$2,000
August 5, 1886	2,000
August 11, 1888	3,000
September 19, 1890	3,000
Total	[b]10,000

COMMERCIAL STATISTICS.

The commerce of this stream consists of cotton, turpentine, rosin, molasses, honey, and miscellaneous articles, which are carried by water to Pensacola to market, four steamers being engaged in the trade, the value of which in 1904 is estimated at $400,000.

Q 9.

IMPROVEMENT OF PENSACOLA HARBOR, FLORIDA.

For description of original condition of the improvement, project, and work done see Annual Report of the Chief of Engineers for 1904, page 313.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Work during the year has been confined to care and preservation of property and to examinations of Caucus channel to determine the progress of the shoaling. At the beginning of the year this channel had a minimum low-water depth of 29 feet for an estimated width of 100 feet, but an examination made on June 8, 1904, indicates that the present low-water depth has been reduced to less than 27 feet and the corresponding width to less than 100 feet. As the large bunker coal trade of Pensacola requires a draft of at least 28 feet, the shoaling has reached a point where the commerce and reputation of Pensacola as a deep-water harbor may be seriously injured at any time by the grounding of a vessel in the channel, and negotiations are in progress to secure a dredge for immediate work on the channel, as the dredge belonging to the improvement will not be available for some months to come. It was expected that no dredging would be required before the dredge now building for Pensacola Harbor was available, and such would have been the case had this dredge been completed May 31, 1904, as required by the terms of the contract.

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[a] Allotted from appropriation of $20,000 for improving Choctawhatchee River.

[b] Of this amount there was returned to the Treasury $4,839.20, which was reappropriated by act of March 3, 1899.

RECOMMENDATIONS.

The Caucus channel should be restored to its full projected depth for a width of at least 100 feet as soon as possible, and provision should be made for the continuous operation of the new dredge building for improvement as soon as she becomes available. Until the channel has been put in good condition she should be worked to her maximum capacity day and night.

It is proposed to apply the available funds to dredging the Caucus channel, by contract or with Government plant, and to apply the additional appropriations recommended to work on the approved project with the dredge now building for the improvement.

Money statement.

July 1, 1903, balance unexpended		$69, 150. 09
June 30, 1904, amount expended during fiscal year for maintenance of improvement		1, 303. 71
July 1, 1904, balance unexpended		67, 846. 38
July 1, outstanding liabilities		160. 35
July 1, 1904, balance available		67, 686. 03
Amount (estimated) required for completion of existing project		310, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$75, 000. 00	
For maintenance of improvement	50, 000. 00	
		125, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

June 18, 1878	$20, 000	July 13, 1892	$75, 000
March 3, 1879	10, 000	August 18, 1894	100, 000
June 14, 1880	40, 000	June 3, 1896	200, 000
March 3, 1881	20, 000	March 3, 1899	70, 000
August 2, 1882	50, 000	June 6, 1900 (allotment)	5, 000
July 5, 1884	55, 000	June 13, 1902	[a]220, 000
August 5, 1886	20, 000		
August 11, 1888	35, 000	Total	945, 000
September 19, 1890	25, 000		

COMMERCIAL STATISTICS.

The following information has been obtained from the collector of customs, port of Pensacola, Fla.:

Exports to foreign ports	$15, 893, 456. 00
Exports to coastwise ports	([b])
Imports from foreign ports	568, 722. 52
Duties on imports and miscellaneous collections	7, 906. 26
Total	576, 628. 78

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[a] Includes $150,000 appropriated for construction of seagoing dredge.

[b] No record.

	Number.	Tons.
Vessels entered from—		
Foreign ports	356	499,562
Coastwise ports	156	268,662
Total	512	768,224
Vessels cleared for—		
Foreign ports	418	639,543
Coastwise ports	65	61,143
Total	483	700,686
Steam vessels employed in traffic of port	37	3,215
Sail vessels employed in traffic of port	114	3,902
Total	151	7,117

Amount of fees, dues, and duties paid during the year, $31,871.78.

Freight carried.

Articles.		Quantity.	Value.
Lumber and timber	feet B. M.	174,190,000	$2,840,763
Rosin	barrels	155,269	464,729
Spirits	gallons	257,102	147,484
Cotton	bales	127,968	7,884,293
Coal	tons	308,876	748,925
Miscellaneous			3,807,262
Total			15,893,456

Q 10.

IMPROVEMENT OF ESCAMBIA AND CONECUH RIVERS, FLORIDA.

For description of this waterway and statements of condition and project see Annual Report of the Chief of Engineers for 1904, page 315.

The object of the improvement is to keep open a channel suitable for the safe passage of rafts and logs during low stages of the river, and to enable tugs to cross the bar at the river's mouth to handle the raft timber. This object has been accomplished once, but the improvement has since deteriorated greatly.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

Due to lack of funds, work has been confined to care and preservation of plant. The snag boat and dredge belonging to this improvement were employed on the Choctawhatchee and Holmes rivers.

RECOMMENDATIONS AND ESTIMATES.

The bar at the mouth of the river should be redredged to permit the entrance of tugs to secure the rafts, which they tow to Pensacola, as these rafts now have to be floated out over the bar, involving serious delays and losses. The river should also be kept in good condition for rafting, as the output of this river forms a large part of the lumber trade of Pensacola. This work will require the continuous operation of the snag boat and dredge.

It is proposed to apply the additional appropriations recommended as follows:

Dredging channel over bar	$12,000
Operation of snag boat	10,000
Total	22,000

Money statement.

July 1, 1903, balance unexpended	$1,214.31
June 30, 1904, amount expended during fiscal year for maintenance of improvement	455.01
July 1, 1904, balance unexpended	759.30
July 1, 1904, outstanding liabilities	49.50
July 1, 1904, balance available	709.80
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	22,000.00

APPROPRIATIONS.

For Escambia River:	
March 2, 1833	$5,000
July 2, 1836	5,500
June 14, 1880	8,000
March 3, 1881	5,000
July 5, 1884	3,000
For Escambia and Conecuh rivers:	
August 2, 1882	12,000
July 5, 1884	12,000
August 5, 1886	12,000
August 11, 1888	10,000
September 19, 1890	7,500
July 13, 1892	8,000
For Escambia and Conecuh rivers—Continued.	
August 18, 1894	$6,000
June 3, 1896	4,000
March 3, 1899	5,000
June 6, 1890 (allotted from emergency act)	1,500
June 13, 1902	5,000
Total	109,500
Carried to the surplus fund, 1838	5,500
Balance	104,000

COMMERCIAL STATISTICS.

The commerce of this stream is mainly timber, lumber, and saw logs. It is reported as being valued at about 60 per cent of the timber export trade of Pensacola, or, in round numbers, $1,704,500.

Q 11.

IMPROVEMENT OF ALABAMA RIVER, ALABAMA.

For description, statements of past and present conditions, and project see Annual Report of the Chief of Engineers for 1904, page 316. Previous operations upon this river will be found in Annual Reports of the Chief of Engineers as follows: 1896, pages 1397 et seq.; 1898, pages 1406 et seq.; 1899, pages 1677 et seq.; 1900, pages 2133 et seq.; 1901, pages 1786 et seq.; 1902, pages 1272–1273, and 1903, page 1228.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1904.

The snag boat *Wm. J. Twining* was employed throughout the low-water season removing obstructions from the river, the greater part of the work being required in the Dixie Cut-off at the head of Tait shoals. This cut-off is about 750 feet long, and it has, by breaking across a narrow point at the extremities of a long bend, cut out about 5 miles of the original river, which has shoaled very rapidly. After completing work at the cut-off, the *Twining* worked up the river to Selma, returned down the river to Mobile, where she was docked for minor repairs, and then worked up the river again to Montgomery.

The following is a statement of the season's work:

Overhanging trees removed	332
Overhanging trees trimmed	455
Logs on bank cut up	18
Stumps removed from bank	44
Stumps removed from river	43
Snags removed from river	447
Logs and trees removed from river	12
Deadheads removed from river	73
Driven piling removed from river	17
Drift piles dislodged and broken up ... acres	2

At a total cost of $6,098.52.

All the stumps, snags, logs, and trees removed at the Dixie Cut-off were very large, heavy, and exceedingly troublesome to handle, and the work there was subject to frequent interruptions from passing boats and rafts.

During the month of June, 1904, the *Twining* has been partially overhauled and the repairs necessary to put her in condition for the season are still in progress.

To preserve the plant belonging to the improvement the hull of dredge was recalked and new canvas roof put on. The decks and house of the pile-driver barge were repaired and a storage room added to receive the serviceable tools and other property stored on the old quarterboat which had been condemned. The materials of the house of this quarterboat were used in constructing the storeroom.

Due to lack of funds, no contraction works were built during the year and no repairs were made to those previously constructed.

In January, 1903, the towboat *John Mills* was loaned temporarily to Capt. William E. Craighill, Corps of Engineers, for work on the Warrior River, and as no funds were available to keep her employed on this river during the year she is still retained by Captain Craighill.

RECOMMENDATIONS AND ESTIMATES.

Snagging operations should be continued; the old works of regulation should be repaired or rebuilt where necessary; new works of regulation should be constructed at once at Upper Gause bar, Gardners Island, Mary Taylors bar, and Silver Creek shoals, and dredging should be carried on in connection with all these works of regulation.

In recent years the funds available have been insufficient for maintenance and no material benefits can be had unless sufficiently large appropriations are made to permit a vigorous prosecution of the improvement.

On May 31, 1904, an allotment of $4,000 was made from the appropriation for emergencies in river and harbor works, act of June 13, 1902, for restoration and maintenance.

It is proposed to apply all funds available to snagging operations, and the funds recommended for appropriation to snagging operations, to repair and construction of works of regulation, and to dredging, including the construction of a suitable hydraulic dredge for this purpose.

Money statement.

July 1, 1903, balance unexpended		$14,729.42
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902		4,000.00
		18,729.42
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		10,282.09
July 1, 1904, balance unexpended		8,447.33
July 1, 1904, outstanding liabilities		1,066.08
July 1, 1904, balance available		7,381.25
Amount (estimated) required for completion of existing project		176,251.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$100,000.00	
For maintenance of improvement	25,000.00	
		125,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

June 18, 1878	$25,000	July 13, 1892	$70,000
March 3, 1879	30,000	August 18, 1894	50,000
June 14, 1880	25,000	June 3, 1896	40,000
March 3, 1881	20,000	March 3, 1899	50,000
August 2, 1882	20,000	June 13, 1902	20,000
July 5, 1884	10,000	June 13, 1902 (allotment made May 31, 1904)	4,000
August 5, 1886	15,000		
August 11, 1888	20,000		
September 19, 1890	20,000	Total	419,000

COMMERCIAL STATISTICS.

Statement of business done by steamboats plying the Alabama River, Alabama, compiled from information furnished by owners of same.

Stern-wheel steamboats.	Registered tonnage.	Draft.		Round trips.	Between—	Passengers.
		Light.	Loaded.			
		Inches.	*Feet.*			
Nettie Quill	299	30	6	50	Mobile and Selma, Ala	4,631
City of Mobile	209	22	5	46	Mobile and Montgomery, Ala.	3,276
Mary[a]	198	30	6			
Ouachita[b]	98	20	4			
3 barges	320	10	3			

[a] Laid up. [b] No returns.

Freight carried.

Articles.	Quantity.	Tons.
Cotton ... bales..	47,200	11,800
Cotton seed ... sacks..	190,257	10,570
Cotton-seed meal ... do....	84,174	4,209
Fertilizers ... do....	137,456	13,745
Oats ... do....	82,125	8,212
Corn ... do....	53,278	4,440
Hay ... bales..	35,762	1,788
Wool ... do....	1,717	343
Rosin ... barrels..	35,455	7,100
Turpentine ... do....	24,490	4,898
Flour ... do....	83,725	8,372
Sugar ... do....	16,565	2,366
Molasses ... do....	8,925	2,231
Bagging ... rolls..	71,850	1,796
Ties ... bundles..	83,750	1,047
General miscellaneous ... packages..	63,000	6,300
Hides and skins ... do....	1,150	230
Live stock ... head..	5,680	1,136
Lumber ... feet..	650,760	1,300
Staves ... pieces..	150,768	1,507
Provisions (case goods) ... packages..	81,960	4,098
Coffee ... sacks..	10,957	913
Corn meal ... do....	82,878	4,143
Bacon, smoked and dry salted ... boxes..	29,850	4,974
Salt ... sacks..	27,440	2,744
Lard ... packages..	31,762	3,976
Soap ... boxes..	33,942	1,697
Nails ... kegs..	82,450	4,122
Shingles ... number..	1,267,400	12,674
Brick ... do....	146,000	365
Total ...	...	133,092

Estimated value of above freight (in round numbers) ... $9,317,000
Estimated value of hewn, sawn, and round timber ... 4,000,000

The total commerce of the year was less than during the previous year, due to the unfavorable condition of the river.

Very large quantities of sawn and hewn timber, saw logs, cord wood, etc., consisting of yellow pine, sycamore, cottonwood, poplar, and ash, are barged and rafted down this stream to Mobile, Ala., but the amount of this business can not be accurately stated, as the statistics of the port of Mobile combine the receipts from this stream with those from the Tombigbee and other streams tributary to that port.

Q 12.

IMPROVEMENT OF COOSA, OOSTENAULA AND COOSAWATTEE RIVERS, GEORGIA AND ALABAMA.

For description of these rivers and statements of past and present conditions and project see Annual Report of the Chief of Engineers for 1904, page 317.

The survey of the Coosa River required by the river and harbor act of June 13, 1902, was completed during the fiscal year and report thereon submitted to the Chief of Engineers on June 30, 1904.

(A) COOSA RIVER, BETWEEN ROME AND THE EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

OPERATIONS DURING FISCAL YEAR ENDING JUNE 30, 1904.

Under provisions of river and harbor act of June 13, 1902, expenditures were limited to that part of the improvement between Rome, Ga., and Lock 4, and to the care of Government property belonging to the improvement.

The new hull and upper works for the towboat *Leota*, under construction at the beginning of the fiscal year, were completed sufficiently to make the boat available and she was put in commission. On October 1, 1903, she left Lock 4 with the dredge and two barges in tow to commence work on the river between Rome and Gadsden. The dredge was dropped at a bar 26 miles below Rome, where dredging had been suspended in 1898, and the towboat and barges proceeded to Blacks Bluff, 4 miles below Rome, to commence work on Horseleg shoals. During the remainder of the season the dredge worked over 33 miles of river, excavating a channel to a minimum width of 40 feet and a low-water depth of 4 feet, removing a quantity of sand and gravel estimated at 25,000 cubic yards. In addition she removed 53 snags from the channel and cut 48 overhanging trees on the banks of the river. Work on the improvement of Horseleg shoals was commenced on October 10, 1903, and completed on December 19, 1903, when operations were suspended for the season on account of cold weather and the approach of the high-water season. Nine hundred linear feet of cribwork training dam, with a width of 6 feet and an average depth of 4½ feet, were put in place and filled with riprap stone quarried at Blacks Bluff and estimated at 910 cubic yards. After suspension of work new boilers were installed on the towboat at Gadsden, Ala., and the plant then laid up at Lock 3.

On June 20, 1904, the *Leota* with the dredge and two barges in tow left Lock 4 for the upper river to commence work on the channel between Rome, Ga., and Lock 4. The dredge was dropped at McCoy Island shoal to begin work there and the *Leota* proceeded to Mill shoal to begin work of repairing old works of regulation. At the end of the fiscal year preliminary operations for the season's work were in progress.

A watchman was in charge of the Government property at Lock 4 throughout the year and another in charge of the fleet at Lock 3 during the winter and spring.

RECOMMENDATIONS AND ESTIMATES.

It is recommended that a channel for 4-foot navigation be secured and maintained between Rome, Ga., and Lock 4, Alabama; that Lock 4 be completed with necessary modifications to provide for a subsequent increase in lift of 3 feet should the improvement of the Coosa and Alabama rivers for a 6-foot navigation be undertaken at any time and the elevation of Dam 4 be required; that the dam, abutment, and levees at Lock 5 be constructed, provision being made for the subsequent construction of the lock should the improvement of the lower Coosa for 6-foot navigation be undertaken at any time.

This work will extend navigation to the site of Lock 5, reaching Riverside and Coosa Valley at the crossings of the Southern and Coosa Valley railroads, and give continuous navigation for 191 miles below Rome, Ga., through the four upper locks.

The estimate for the work recommended is as follows:

Continuing channel work between Rome, Ga., and Lock 4	$50,000.00
Completing Lock 4	282,000.00
Constructing dam at site of Lock 5	115,000.00
Total	447,000.00

It is proposed to apply the available funds to improving the channel between Rome, Ga., and Lock 4, and to apply the additional amount recommended to the further improvement and maintenance of the channel between Rome, Ga., and Lock 4, to completing Lock 4, and to building a dam without lock at the site proposed for Lock 5, the next in the series below.

Money statement.

July 1, 1903, balance unexpended		$24,603.94
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	$7,500.00	
Received from sale of property	125.65	
		7,625.65
		32,229.59
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		17,953.72
July 1, 1904, balance unexpended		14,275.87
July 1, 1904, outstanding liabilities		1,731.25
July 1, 1904, balance available		12,544.62
Amount (estimated) required for completion of existing project		1,143,523.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$422,000.00	
For maintenance of improvement	25,000.00	
		448,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

August 14, 1876	$30,000.00
June 18, 1877	75,000.00
March 3, 1879	45,000.00
July 14, 1880	75,000.00
March 5, 1881	60,000.00
August 2, 1882	83,700.00
July 5, 1884	50,000.00
August 5, 1886	45,000.00
August 11, 1888	60,000.00
September 19, 1890	150,000.00
July 13, 1892	130,000.00
August 18, 1894	110,000.00
June 3, 1896	50,000.00
March 3, 1899	20,000.00
June 13, 1902	35,000.00

June 13, 1902, amount made available from lower division of river	$10,000.00
Received from sales of property	1,448.05
June 13, 1902 (allotment made May 31, 1904)	7,500.00
	1,037,648.05
Less amount transferred by act of June 13, 1902, to the Oostenaula and Coosawattee rivers	10,000.00
Total	1,027,648.05

COMMERCIAL STATISTICS.

Commercial statistics for the fiscal year ending June 30, 1904, furnished by the Georgia and Alabama Steamboat Company, of Rome, Ga., and the Lathrop-Hatton Lumber Company, of Riverside, Ala., are given in the following table:

Stern-wheel steamboats.	Registered tonnage.	Draft.	
		Light.	Loaded.
		Inch.	*Inch.*
Willie C. Wagnon	151	18	52
Connasauga	81	17	48
Sporter	54	12	36

Freight carried.

Articles.	Quantity.	Tons.
Cotton ....bales..	7,400	1,850
Cotton seed ....sacks..	23,500	1,650
Cotton-seed meal ....do....	5,800	290
Fertilizers ....do....	28,500	2,850
Oats ....do....	5,800	464
Corn ....do....	13,800	1,110
Hay ....bales..	8,600	448
Flour ....barrels..	4,000	400
Sugar ....do....	650	120
Molasses ....do....	400	110
Bagging ....rolls..	2,200	105
Ties ....bundles..	2,800	56
General merchandise ....packages..	22,500	1,655
Live stock ....head..	100	55
Lumber ....feet..	9,650,000	24,150
Staves ....pieces..	24,000	240
Provisions, case goods ....packages..	3,000	1,200
Coffee ....sacks..	600	42
Corn meal ....do....	15,000	212
Bacon, smoked and dry salted ....boxes..	2,810	145
Salt ....sacks..	4,000	318
Lard ....packages..	1,700	49
Soap ....boxes..	1,325	59
Nails ....kegs..	1,200	60
Shingles ....number..	1,150,000	312
Brick ....do....	20,000	50
Total	....	38,000

Estimated value of above freights, $1,825,000.

In addition to freight carried by steamboats, the Lathrop-Hatton Lumber Company estimate that they rafted down the river during the past fiscal year 2,000,000 feet of saw logs, valued at $10,000.

(B) COOSA RIVER BETWEEN WETUMKA AND EAST TENNESSEE, VIRGINIA AND GEORGIA RAILROAD BRIDGE.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

The property belonging to the improvement was properly cared for and such slight repairs were made to the lock house, fences, cement warehouse, and general storage sheds as were found necessary. The old lumber from the cofferdam, which had become rotten and unserviceable, was sold and removed from the lock yard at Wetumka.

RECOMMENDATIONS AND ESTIMATES.

The buildings and property at Lock 31 should be cared for, and there will be required for this purpose $1,000 in addition to funds already available. At present no other work is recommended pending a decision as to the character and extent of the further improvement of the Coosa River. Should a new project for securing 6-foot navigation in the Coosa and Alabama rivers be adopted, funds should be made available for examination of lock sites, borings for foundations, discharge measurements, gauge observations, and other necessary work preliminary to actual construction.

It is proposed to apply the funds available and the additional funds recommended to the care and preservation of property at Lock 31.

Money statement.

July 1, 1903, balance unexpended	$12,707.12
Amount received from sale of property	423.32
	13,130.44
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	11,460.04
July 1, 1904, balance unexpended	1,670.40
July 1, 1904, outstanding liabilities	576.65
July 1, 1904, balance available	1,093.75
Amount (estimated) required for completion of existing project	4,916,390.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	1,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

September 19, 1890	$150,000.00
July 13, 1892	100,000.00
August 18, 1894	110,000.00
June 3, 1896	50,000.00
Amount received from sale of Government property	423.32
	410,423.32
Less amount transferred by act of June 13, 1902, to upper division of the river	10,000.00
Total	400,423.32

COMMERCIAL STATISTICS.

On this part of the Coosa River there is a small commerce in the rafting of saw logs and square timber, but this can be carried on only during the season when the river is about 12 feet above low water, and no reliable estimate of its value can be obtained.

(C) OOSTENAULA AND COOSAWATTEE RIVERS.

For description, statements of past and present conditions, and project see Annual Report of the Chief of Engineers for 1904, page 320.

Description of previous operations upon these rivers will be found in Annual Reports of the Chief of Engineers as follows: 1872, page 507; 1874, page 581; 1875, page 792; 1876, page 714; 1879, page 1271 et seq.; 1880, pages 1692–1693; 1881, pages 1873–1874.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

The existing project is that part of the river and harbor act approved June 13, 1902, applying to these rivers, and is as follows:

> Improving the Coosa River, Georgia and Alabama, and the Oostenaula and Coosawattee rivers, Georgia, thirty-five thousand dollars, of which amount ten thousand dollars, or so much thereof as may be necessary, shall be expended upon the last-named rivers.

No estimate of cost other than that quoted from the river and harbor act above was made.

The appropriation was too small to justify the Government in acquiring a plant for this work, and contract was therefore entered into with J. D. Kirkpatrick and W. S. Langford for the hire of one towboat and crew, one quarter boat, and one barge. With this plant and hired labor work was commenced on the channel September 24, 1903, and completed January 2, 1904. The channel was cleared of obstructions from Rome, Ga., to Carters Mill, Ga., for a depth of 2 feet at low water and a minimum width of 30 feet, the work done being as follows:

Overhanging trees cut		1,208
Overhanging trees trimmed		803
Bushes cut (estimated)		545
Logs removed from bank		52
Snags removed from river		211
Logs removed from river		48
Dams built	linear feet	2,913
Stone used in dams	cubic yards	2,576
Channel excavated:		
Rock	do	153
Sand and gravel	do	19
Stone quarried	do	845
Quarry stripped, earth	do	42

The commercial benefits to be derived from the improvement of these rivers are very small, and any further improvement at present of doubtful value, but should any future appropriations be made for these rivers they should provide for the construction and operation of a suitable plant, consisting of one small light-draft snag boat and two light-draft barges, which could be utilized on the upper Coosa River also, for no suitable plant can be hired and rentals for plant obtainable are exorbitant.

Estimate for this plant and operation for one year is as follows:

Construction of light-draft snag boat	$8,000
Construction of two barges	3,000
Operation of plant	6,500
Total	17,500

Money statement.

July 1, 1903, balance unexpended	$9,922.92
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	7,078.72
July 1, 1904, balance unexpended	2,844.20
July 1, 1904, outstanding liabilities	3.00
July 1, 1904, balance available	2,841.20

APPROPRIATIONS.

1874	[a] $10,000	1881	$1,000
1875	5,000	1882	1,000
1878	4,000	1902	10,000
1879	3,000		
1880	2,000	Total	[b] 36,000

[a] Oostenaula River. [b] In 1897 $499.39 was covered into the surplus fund.

COMMERCIAL STATISTICS.

Statement of business done by the Georgia and Alabama Steamboat Company on the Oostenaula and Coosawattee rivers, Georgia, during the fiscal year ending June 30, 1904.

Name and description.	Registered tonnage.	Draft.		Round trips.	Between—
		Light.	Loaded.		
		Inches.	*Inches.*		
Stern-wheel steamboat Connasauga.	81	17	48	10	Carters, Ga., and Rome, Ga.

Freight carried.

Articles.		Quantity.	Tons.
Cotton	bales	90	22
Cotton seed	sacks	1,500	90
Fertilizers	do	1,000	100
Lumber	feet	400,000	1,200
Total			1,412

Estimated value of above freights, $12,000.

Q 13.

OPERATING AND CARE OF CANALS AND OTHER WORKS OF NAVIGATION ON COOSA RIVER, GEORGIA AND ALABAMA.

Locks 1, 2, and 3 were opened to navigation June 30, 1890, and have been operated continuously ever since except during such periods as it was necessary to close them for repairs.

In February, 1895, the canal between Locks 2 and 3 was frozen over for a period of ten days, and again in February, 1899, while the lock at No. 3 was being repaired, the temperature falling to $-8\frac{1}{2}°$, the lowest recorded for this locality.

The amount expended to the end of the fiscal year ending June 30, 1904, was $134,856.42.

During the fiscal year ending June 30, 1904, the locks were operated continuously with the exception of Lock 1, which was closed for a few days while the silt was being dredged from behind the lower gates.

An allotment of $6,900 was made for the fiscal year ending June 30, 1904, for the following purposes:

Salaries of lock keepers	$1,800
Dredging entrances to Locks 1, 2, and 3	1,500
Repainting Lock houses 1, 2, and 3	600
Repairs to dam at Lock 4	3,000
Total	6,900

At Lock 4 the break in the main dam was repaired, the cofferdam above the lock site raised and repaired, and the toe of the dam at the foot of the log chute protected with stone.

Repairs to small breaks in the dams at Locks 1 and 2 were made and the gates at Lock 1 renewed; dredging was done at the entrances to

Locks 1, 2, and 3, and behind the gates at Lock 1; minor repairs were made to the lock keepers' houses at Locks 1, 2, and 3 and these houses repainted, the outbuildings at Lock 4 were reshingled.

Summary of expenditures made during the fiscal year ending June 30, 1904, at Locks 1, 2, 3, and 4.

Services	$4,502.89
Material and supplies	727.19
Telegram	.45
Provisions	131.54
Fuel	180.54
Travel expenses	30.20
Total	5,572.81

Q 14.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

The steamer *C. Emlin*, which was burned and sunk in the channel opposite the town of Apalachicola, Fla., having been reported as an obstruction to navigation, with the approval of the Secretary of War, notice was sent the owners to remove same, and they reported that they wished to do so. Subsequently they reported, under date of June 29, 1903, that they had removed the machinery and abandoned that portion of the vessel which remained. All bids for removing the wreck by contract being considered too high, it was removed by hired labor with Government plant.

The schooner *Grace Andrews* and the tug *Bishop*, sunk near the mouth of Carrabelle River, having been reported as obstructions to navigation, an allotment for their removal was made June 8, 1904, from the indefinite appropriation made by the river and harbor act of March 3, 1899. Preliminary steps have been taken to have them removed by contract.

Q 15.

PRELIMINARY EXAMINATION OF BLACKWATER AND UPPER EAST BAYS, AND BLACKWATER RIVER FROM MILTON TO THE MOUTH, FLORIDA.

[Printed in House Doc. No. 193, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith report dated June 27, 1902, by Lieut. R. R. Raymond, Corps of Engineers, on preliminary examination of Blackwater and Upper East bays, and Blackwater River from Milton to the mouth, Florida, made in compliance with a requirement of the river and harbor act of June 13, 1902. In the opinion of Lieutenant Raymond, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, the locality is not worthy of improvement by the General Government except to the extent contemplated by the existing project which was adopted by the river and harbor act of March 3, 1899, and provides for securing a channel 9 feet deep with a width of 100 feet, the completion of which is estimated to cost $15,000.

This report has been reviewed by the Board of Engineers for Rivers and Harbors in pursuance of the provisions of sections 3 and 14 of the above-mentioned act, and I concur in the opinion of the Board expressed in its report of December 4, 1902, that the present and prospective commerce is sufficient to warrant continuing the improvement by the expenditure of $15,000 in obtaining a depth of 9 feet from the mouth of the river to deeper water in the bay.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF FIRST LIEUT. R. R. RAYMOND, CORPS OF ENGINEERS.

United States Engineer Office,
Montgomery, Ala., June 27, 1902.

General: In accordance with the provisions of river and harbor act of June 13, 1902, and of letter from your office of June 23, 1902, I have the honor to submit the following report upon preliminary examination of "Blackwater and Upper East bays, and Blackwater River, from Milton to the mouth."

There being sufficient data in this office upon which to base this report no survey or examination upon the ground has been necessary and no expense has been incurred.

Milton, Fla., is situated upon Blackwater River about 4 miles above its mouth.

The various links of the waterway between Milton and Pensacola Bay may be described as follows:

1. Blackwater River, distance 4 miles; depths varying from 9 feet to 30 feet.
2. Blackwater Bay, distance 5 miles; depths varying from 7 feet to 9 feet.
3. East Bay, distance 5 miles; depths varying from 8 feet to 10 feet. A further distance of about 2 miles must be traversed, in depths varying from 10 feet to 16 feet, if it be desired to connect with 3-fathom depths in Pensacola Bay.

In 1881 (see p. 1309, Annual Report, Chief of Engineers, 1882), there was submitted a report upon an examination of this waterway, wherein appeared an estimate of $20,000 for dredging at Hunts bar, within the river proper, and at the shoalest points within the bay, with the object of obtaining a channel 9 feet deep throughout.

No appropriation for work was made prior to the act approved March 3, 1899, which carried $5,000 for this improvement. This sum was expended at Hunts bar, which has been dredged to a depth of 11 feet.

The act directing this preliminary examination specifies no depth or width of channel; therefore some consideration is given to various conditions of depth that might be considered desirable.

The bulk of the present commerce, which is referred to in the accompanying papers, is carried on by means of lighters, for which there is already a channel 7 feet deep at mean low water. Doubtless a 10-foot channel would better serve the purpose. Some of the boats now using the waterway are of such deep draft as to touch bottom occasionally, especially during northers, when the water surface is lowered. If the channel were dredged to 10 feet, deeper draft boats would probably be used, effecting minor savings. In this case, also, the marine ways and dry dock, now located on the Blackwater River, would serve a greater number of boats plying about the harbor of Pensacola.

It is estimated that the cost of dredging such a channel 100 feet wide would be $60,000 if a single appropriation were made of the whole amount. About 300,000 cubic yards of material would require removal, and the length of the dredged channel would cover a distance of about 10 miles.

No depth greater than 10 feet and less than 18 feet would effect any considerable economies in transportation. With any intermediate depth between those stated, the business would still be compelled to resort to lighters for which 10 feet is ample depth.

If, on the other hand, 18-foot depths were procured vessels could load at the wharves in Milton and lighterage could be avoided. To dredge such a channel 150 feet wide would involve the removal of, approximately, 5,000,000 cubic yards of material at a cost of $600,000 if the money were appropriated in a lump sum, or if the work were placed under the continuous-contract system.

It may fairly be assumed that the annual cost of maintenance of the 10-foot channel would be $6,000, and of the 18-foot channel $50,000.

Considering both maintenance and 3 per cent interest on cost of improvements outlined above, it would seem that the 10-foot channel would be equivalent to an annual charge against the United States of $7,800, while the 18-foot channel would be an annual charge of $68,000.

After careful consideration of the character and amount of commerce involved, I cannot believe that either channel would effect savings equal to cost, and I am therefore constrained to report the channel unworthy of improvement to the extent of securing depths of 10 feet or greater.

The existing project is based upon the report of 1881, heretofore mentioned, and contemplates a 9-foot channel. A part of this work has been done, namely the dredging of Hunts bar, and another part of the work in the original estimate, namely, the dredging of the lumps known as the "Beer Garden," has ceased to be of importance, due to natural causes.

The remainder of the work to be done under the original project is to dredge a 9-foot channel through certain obstructing sand ridges in Blackwater Bay at a cost of $14,000, this estimate being based upon the removal of 28,000 cubic yards at 50 cents per cubic yard. So much of the channel is now about 9 feet deep, or a few inches more or less, that any two independent surveys due to unavoidable errors in selection of datum plane of mean low water and in reading gauges and sounding rods would give widely differing estimates as to the cost of a 9-foot channel.

In my opinion the channel from Milton, Fla., through Blackwater River, Blackwater and Upper East bays, is worthy of improvement at present to the extent of dredging the obstructing sand ridges to a depth of 9 feet and a width of 100 feet at a cost, including supervision, of $15,000.

No survey is considered necessary.

Very respectfully, your obedient servant,

R. R. RAYMOND,
First Lieut., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[Second indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., August 15, 1902.

Respectfully returned to the Chief of Engineers, United States Army.

In view of the facts presented by Lieutenant Raymond, I concur in his conclusion that "Blackwater and Upper East bays [Florida], and Blackwater River, from Milton to the mouth," is not worthy of improvement by the General Government beyond that contemplated by the present project.

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 20, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Fourth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 4, 1902.

Respectfully returned to the Chief of Engineers, United States Army.

The river and harbor act of March 3, 1899, carried an appropriation of $5,000 for improving Blackwater River from Milton to its mouth in accordance with the project submitted. The project was presented in 1881, and contemplated an expenditure of $20,000 with a view to obtaining a channel 9 feet in depth from Milton to Pensacola Bay. The appropriation of 1899 was expended in obtaining that depth in the river.

The Board is of the opinion that the present and prospective commerce is sufficient to warrant continuing the improvement by the expenditure of $15,000 in obtaining a depth of 9 feet from the mouth of the river to deeper water in the bay, in accordance with the recommendation of the local officer.

The data already available having proved sufficient to form an estimate of cost no further survey is deemed necessary.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

LETTER OF MESSRS. SIMPSON & CO.

Bagdad, Fla. (near Pensacola), *March 4, 1901.*

Dear Sir: Your favor, February 11, to Captain Barrow, master tug *Okoloosa*, has been handed to us for reply.

We got up the information contained in the printed page headed "Proposed dredging in Pensacola Bay" at the time the dredging of Blackwater River was first agitated. Since that matter was printed there was an appropriation of $5,000, which was all expended in dredging Hunts bar, and we understand that there is now 10 feet on Hunts bar at low-water depth.

Between Hunts bar and White Point, a distance of 15 miles, there are several shoal places, or oyster beds, which it is very desirable to have dredged, so that there may be a uniform depth the whole distance. It is rather difficult to locate these shoal places without a series of soundings, which we have not been able to make.

The amount of commerce going out of this river is considerable, and we hope that you will be able to make a favorable report on the matter. If we can give you any additional information we will be glad to do so.

Yours, truly,

Simpson & Co.

Capt. W. V. Judson,
Corps of Engineers, U. S. A.

PROPOSED DREDGING IN PENSACOLA BAY.

The proposed improvements in Pensacola Bay for which Congress has been petitioned include dredging some sand bars between White Point, Pensacola Bay, and the mouth of the Blackwater River. This would involve a comparatively small expenditure and open a large and valuable territory tributary to Pensacola.

The United States Government has already made a careful survey of all this area, and a chart has been published showing the sand bars which it is proposed shall be removed. The preliminary work has been done. Nearly all the leading Pensacola merchants, bankers, lawyers, and other prominent men have signed the petition for this work, and the following facts are sufficient indorsement of this petition:

The value of timber and lumber going out of this river amounts to from $700,000 to $800,000 annually, and the manufactured product of the sash factory at Bagdad is from $25,000 to $35,000. In addition to this there are wool and other products shipped from Milton amounting to from $35,000 to $50,000. There is a dry dock at Bagdad and a marine railway at Milton, to which nearly all of the steamboats and sailing vessels owned at Pensacola come, and a great many more would come if there was sufficient water. There are 21 steamboats and over 100 sailing vessels registered at Pensacola, and a great many of them are fishing boats of deep draft. If the lumber vessels could load at the mills it would be an annual saving of about $50,000 for lighterage, and if the river was deepened there would be other industries established along its banks.

The Blackwater River is a broad deep stream with a slow current and remarkably well suited for loading vessels at the mills on the river, which are among the largest and most important in the South.

LETTER OF MR. W. G. BARROW.

Pensacola, Fla., *January 9, 1901.*

Dear Sir: I am in the employ of the Messrs. Simpson & Co., representing the largest milling interest in this section, as master of the tug *Okoloosa*, and being familiar with matters referred to in your annual report (p. 2128) have been requested to communicate with you as to the immediate need of continued appropriation for Blackwater Bay.

The *Okoloosa* draws 7 feet and frequently scrapes on the sand ridges or mud lumps below Hunts bar. For about 2 miles there are continuous mud lumps, some of them with oysters on.

There are four other tugs and the *City of Tampa* using this route, all of about 7-foot draft, which are frequently impeded by these ridges and in fact deterred from free use of Blackwater navigation. Only about three weeks since the tug *Keyser* was aground there several hours. From continuous scraping the *Okoloosa* is subject to perpetual damage.

We earnestly hope you will take into consideration the great advantages to commerce that would result from the clearing out of those ridges.

We are informed that there will be an appropriation of $1,500 for a resurvey of this route. Would not the immediate application of this sum to the work of cutting out those ridges be the part of economy?

With the data at hand, is it not evident that this $1,500 appropriation will simply be a delay of that which should have been made a working appropriation?

Those ridges are the only obstacles to navigation between Milton and Pensacola.

There is water enough in the "Beer Garden." I have written Senator Mallory, who is somewhat familiar with matters referred to, and hope that with his aid you may see your way clear to such a recommendation as will meet our just demands in this matter.

Yours, very respectfully,

W. G. Barrow,
Master Tug Okoloosa.

Capt. C. A. F. Flagler,
Engineer Corps, Washington, D. C.

Q 16.

PRELIMINARY EXAMINATION OF THE ENTRANCES TO ST. ANDREWS BAY, FLORIDA, AND THENCE UP TO THE TOWN OF ST. ANDREWS BAY.

[Printed in House Doc. No. 250, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 10, 1903.

Sir: I have the honor to submit herewith a report, dated January 28, 1903, by First Lieut. R. R. Raymond, Corps of Engineers, on preliminary examination of "the two entrances to St. Andrews Bay [Florida], with a view to securing a 21-foot channel through one of said entrances and across the bulkhead into said bay up to the town of St. Andrews Bay." This examination was made in pursuance of a requirement in the river and harbor act of June 13, 1902. Lieutenant Raymond considers the locality worthy of improvement by the General Government, and four methods of improvement are suggested by him.

The division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, in forwarding this report, expresses the opinion that a channel 21 feet in depth can not be secured in the manner proposed, and in his opinion the locality is not worthy of improvement by the General Government to the extent proposed by the act.

This report has been reviewed by the Board of Engineers for Rivers and Harbors, in accordance with the provisions of sections 3 and 14 of the above-mentioned act, and in its report of March 11, 1903, the Board concludes that under existing conditions the commerce of St. Andrews Bay is not sufficient to warrant the improvement by the United States as contemplated in the act.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF FIRST LIEUT. R. R. RAYMOND, CORPS OF ENGINEERS.

United States Engineer Office,
Montgomery, Ala., January 28, 1903.

General: I have the honor to submit the following report of a preliminary examination of St. Andrews Bay, Florida, made during the month of August, 1902, in accordance with the provisions of the act of June 13, 1902.

St. Andrews Bay is on the Florida coast, 110 miles southeast of Pensacola, and has an area of about 25 square miles. Three arms of this bay, known as East, North, and West bays, having a combined area of 64 square miles, are connected with St. Andrews Bay by deep channels. Within the bay depths range from 4 to 7 fathoms.

An examination was made in 1889 under the direction of Capt. P. M. Price, Corps of Engineers, at which time the main outlet was through the pass to the east of Hurricane Island and had a least depth on the shoal of 17 feet at low water. The accompanying tracing[a] shows the condition of the entrances about 1882, about 1895, and in 1902.

About 50 years ago Hurricane Island occupied a position over a mile to the westward of its present location, and Lands End was about a mile shorter than it is now. A pass existed between the two.

In 1882 this pass had closed, to break through farther east at a later date. In 1895 Hurricane Island had shifted very nearly to its present position, and has since been fairly stationary.

Lands End, however, has steadily progressed toward the northeast. The channel to the northwest of Lands End is practically fixed. The bottom is well covered by marine plants and shows no movement of sand. The shore line of the mainland also is fairly well fixed;

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[a] Not printed.

but all else to the eastward of Lands End is loose sand in continual motion. Both passes are equally deep, 12 feet at low water. East Pass is buoyed, while West Pass, being the more convenient, is generally used. The deep water to the north of Hurricane Island forms a valuable anchorage for fishing vessels.

Apparently only one channel is good at any one time, an increase in depth in one being accompanied by a shoaling in the other. At present neither channel has sufficient depth for the commerce of the port. Four methods of improving the harbor suggest themselves.

First. Cut a new opening just west of Boat Pass, and maintain same by dredging or jetties. The first cost would be prohibitory, and the sea has shown a decided tendency to close any opening at this point. Boat Pass is at present entirely closed.

Second. Dredge a channel through the shoal at either entrance. The sand at both points is so shifting that it is believed such a channel could not be maintained without great cost.

Third. Close West Pass. Any jetty or breakwater at this point would receive the full force of the sea during southeast gales, and would rest upon a very doubtful foundation.

Fourth. Close East Pass. This could be done by a dam thrown from the eastern point of Hurricane Island to the mainland. It is believed that the construction of such a dam would be followed by a shoaling in East Pass and probably at a point just north of the west end of Hurricane Island, and a decided deepening of West Pass, with a probable erosion of the west end of the island and Lands End. This expectation is strengthened by the apparent history of the locality, which shows a drifting of the entrances to the southeast until the sea breaks through the long sand point formed (at present Lands End), making a new entrance which becomes the deepest until in its turn it has drifted too far and been superseded by a newer opening. The dam would arrest this drifting and make the channel permanent. Assuming the cost of rip-rap in place at $3 per ton, the cost of a dam with crest at low water is roughly estimated at $110,000. It is possible that a submerged dam, costing much less, might answer all purposes and cause Hurricane Island to be united with the mainland by natural processes. It is also possible that the island would require shore protection at its western end. The total cost of the improvement could hardly exceed $150,000.

From a letter received from Mr. L. M. Ware, who has resided at St. Andrews Bay during the past twenty-three years, the following statistics have been obtained:

> The town of St. Andrews Bay has about 300 inhabitants, five general stores, two drug stores, and four churches. The business of the stores will aggregate $90,000 per year. Of this amount, more than half is derived from settlements on the north, east, and west arms of the bay.
>
> The number and character of these settlements are as follows:
>
> North Bay, 4. Bay Head post-office and general store; Tompkins post-office and sawmill; Gay post-office and general store; Anderson post-office and general store.
>
> West Bay, 1. West Bay post-office and general store.
>
> East Bay, 8. Harrison post-office and sawmill; Millville post-office, sawmill, and general store; Cromaton money-order post-office and general store; Parker money-order post-office and general store; Pittsburg post-office and general store; Cook post-office and general store; Farmdale post-office and general store; Wetappo post-office.
>
> The business of stores other than those in the village of St. Andrews Bay will aggregate $80,000 per year. The population tributary to the 13 post-offices named is about 1,500.

There are nine turpentine stills in operation, shipping yearly—

7,200 barrels spirits turpentine 22,500 barrels rosin } value	$250,000
3 sawmills, shipping yearly 28,000,000 feet yellow pine lumber, value	308,000

Yearly shipments of other products are:

3,100 barrels salted fish, value	$16,000
250,000 pounds fish on ice, value	500
2,000,000 oysters, value	3,000
100,000 pounds saw palmetto berries, value	4,000
Hides, poultry, wool, etc., value	8,000

Ninety-five per cent of this business is dependent upon the transportation of freights by vessels, of which there are five constantly employed, exclusive of a line of barges (in tow) transporting lumber to Pensacola for reshipment to foreign ports. The fleet of small sailing craft numbers 20.

The manufacture of naval stores has been established since 1897 and the manufacture of lumber for export since 1899. Both industries will show a large increase during the next few years, as the development of the timber resources is yet in its primary stage.

The following extracts from a letter received from Mr. Francis H. Sheppard, lieutenant-commander, U. S. Navy, retired, are also quoted:

> The commerce of the place is small and the shipping interests unimportant. I have been told that nearly $400,000 worth of lumber and naval stores were sent from this bay by sea during 1900. There is considerable trade in salt fish, but there are no statistics. Much of the catch is sold to Pensacola smacks without ever coming to town, and the regular shipments are not watched. Some wool is sent from here every year by farmers keeping flocks of sheep, but the total is not large. There is a regular trade in palmetto berries also, which is not reportable. The commerce of so small a population with so little capital can not be great. There is one good sawmill, able to cut 40,000 feet, and several small local mills. The lumber is towed to Pensacola by tugs, as there is not water for the lumber ships to enter the bay. The lumber and naval stores production might be considerable if vessels could get in.
>
> The bay has great value, however, on account of its position, its healthfulness, its location with reference to the proposed interoceanic canal, its safe approaches, its lying between the hurricane tracks, and its nearness to the coal, iron, and lumber that will soon seek additional outlets. There is to be a large export trade in the future, and we have but few deep and safe harbors. It is 62 miles from the junction of three roads at Chattahoochee, and the country between is very favorable for building. At the present time a party of engineers are completing a survey and laying out towns on a road from Chipley, or Dothan, to St. Josephs Bay, 20 miles east of us, and this road is to cross (our) East Bay at the head of deep water.
>
> * * * * * * *
>
> The littoral is to the eastward, and I estimate it at an average of half a mile. The drainage basin covers about 650 square miles, and is composed of low, rolling sand hills. The water comes into the bay through a dozen small streams that carry almost no mud and no other material to drop in channels and form bars. The lower bay is always clear, and the water of the last of the ebb tide remains transparent. * * *
>
> It is worth while to consider the improvement of this bay in a permanent and superior manner. It is the only place on the Gulf where 30-foot water can be got at reasonable cost. Pensacola has it, thanks to the engineers, but Pensacola has not and can not get the interior water we already have here. You will see on the tracing[a] over 12 miles of it unbroken, wide enough for large vessels to pass anywhere, wide enough for them to turn at nearly all points, and having a number of broad basins with room for a great number of ships. The truth is that a comparatively small amount of money would make here a harbor better than New York.
>
> I should have mentioned that the rainfall is moderate, the climate being, on the whole, dry, and the tide, once a day, has 20 inches rise and fall, and creates but little current. The place would be ideal for a naval station of supply and repair to serve the Gulf squadron we shall have to maintain.
>
> The only thing against this bay is that it is 50 miles from a railroad. That has prevented the numerous investigating committees seeking some place on the Gulf for a naval station from looking at it; but that is a very slight objection, for as soon as it was known that the United States has taken hold of the bay private capital would compete for the privilege of building a road.
>
> The Government does not know what a valuable place it has here.

---

[a] Not printed.

Should a depth of 21 feet of water be obtained on the bar—the least depth that would be of benefit to commerce, and the original depth that has existed on the bar under natural conditions, when only one channel was open—the commerce of the bay, which is of a general character, would steadily increase, and a large number of vessels would go there to load lumber, naval stores, etc., which are now lightered by a long sea trip to Pensacola for export, the charge for this lighterage on lumber being $2 per 1,000 feet, and on naval stores 25 cents per barrel. At least $64,000 per annum would be saved to shippers on these items of commerce alone.

The opening of the entrances would without doubt be followed by the construction of a railroad to St. Andrews Bay.

In my opinion, and for the reasons stated, the entrance to this bay is worthy of improvement by the General Government. The entrance has been surveyed recently by the Coast and Geodetic Survey. A resurvey is not believed to be necessary.

Very respectfully, your obedient servant,

R. R. Raymond,
First Lieutenant, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., February 10, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army.

The act approved June 13, 1902, requires a preliminary examination of "the two entrances to St. Andrews Bay, with a view to securing a 21-foot channel through one of said entrances and across the bulkhead into said bay up to the town of St. Andrews Bay."

A preliminary examination of this bay was made in 1889 by Capt. P. M. Price, Corps of Engineers, and he was of the opinion that the locality was not worthy of improvement by the General Government. This opinion was concurred in by Col. C. B. Comstock, Corps of Engineers, division engineer of the southwest division.

I do not think that a channel 21 feet in depth can be secured in the manner proposed within by Lieutenant Raymond, and do not consider this locality worthy of improvement by the General Government to the extent proposed by the act of June 13, 1902.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
February 17, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation, as required by section 3 of the act of June 13, 1902. Additional information has been called for, if available.

By command of Brig. Gen Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer, the indorsement of the division engineer, and several letters from interested persons.

The Board is of the opinion that under existing conditions the commerce of St. Andrews Bay is not sufficient to warrant its improvement by the United States as contemplated in the act of June 13, 1902; such an improvement would be relatively very costly.

The Board recognizes the importance of a deep-water harbor on this portion of the coast of Florida, but believes that such a harbor should be selected only after due consideration of all the harbors in this vicinity.

The Board therefore believes that it is not desirable for the United States to undertake the improvement of St. Andrews Bay at this time, but invites attention to the advisability of an investigation of the relative merits of all the harbors in this neighborhood with a view to the selection for improvement of the one showing the most favorable physical and commercial conditions.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

APPENDIX R.

IMPROVEMENT OF RIVERS AND HARBORS IN WESTERN ALABAMA AND EASTERN MISSISSIPPI.

REPORT OF MAJ. W. E. CRAIGHILL, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Harbor at Mobile, Alabama.
2. Black Warrior, Warrior, and Tombigbee rivers, Alabama and Mississippi.
3. Operating and care of locks and dams on Black Warrior River, Alabama.
4. Pascagoula River, Mississippi.
5. Pascagoula, Chickasahay, and Leaf rivers, Mississippi.
6. Harbor at Biloxi, Mississippi.
7. Channel from Gulfport to Ship Island Harbor, Mississippi.
8. Pearl River below Rockport, Mississippi.
9. Pearl River between Edinburg and Jackson, Mississippi.
10. Removing sunken vessels or craft obstructing or endangering navigation.

EXAMINATIONS AND SURVEYS.

11. Black Warrior and Tombigbee rivers, Alabama.
12. Channel from Biloxi to Ship Island Harbor, Mississippi.
13. Chickasahay River, Mississippi.
14. Fish River, Alabama.
15. Horn Island Pass, Mississippi.

United States Engineer Office,
Mobile, Ala., July 20, 1904.

General: I have the honor to forward herewith my annual reports for the fiscal year ending June 30, 1904, for the works of rivers and harbors under my charge.

Very respectfully, your obedient servant,

W. E. Craighill,
Major, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

R 1.

IMPROVEMENT OF HARBOR AT MOBILE, ALABAMA.

Accounts of earlier improvements at this locality are contained in the Annual Reports of the Chief of Engineers for 1896, page 1425; 1900, page 2161, and 1903, page 1237.

During the past fiscal year available funds have been applied to the following operations:

(1) The formation of a 23-foot channel in Mobile River and Bay.

(2) The removal of sunken logs and similar obstructions from the channel in Mobile Harbor.

(3) The deepening of the channel through the outer bar near Fort Morgan.

(1) THE FORMATION OF A 23-FOOT CHANNEL IN MOBILE RIVER AND BAY.

At the close of the fiscal year ending June 30, 1903, a continuing contract with the National Dredging Company, of Wilmington, Del., for dredging a 23-foot channel in Mobile River and Bay was in progress. This contract was dated October 20, 1902, and was approved by the Chief of Engineers on November 18, 1902, and called for the performance of all dredging work at the rate of 8.3 cents per cubic yard, scow measurement. This work was commenced November 25, 1902.

During the past fiscal year operations under this contract were in progress until November 11, 1903, at which time work in connection therewith was completed. Between July 1, 1903, and the date of completion, 2,081,897 cubic yards of material, scow measurement, were removed from the channel, thereby making a total of 4,491,836 cubic yards of material excavated under the entire contract. Upon the completion of these operations an uninterrupted 23-foot channel existed within the limits of the project. This channel had a width of from 100 to 150 feet in Mobile River and the upper bay and a width of from 55 to 90 feet in the lower bay. Recent examinations show that since the suspension of dredging operations the cut between lighthouse beacons 4 and 8, a distance of about 5 miles, has shoaled somewhat, so that the effective depths in this vicinity have been reduced to about 22 or 22½ feet.

The total amount expended during the year on dredging work and operations in connection therewith has been $262,925.22. With future appropriations it is proposed to widen the dredged cut in lower Mobile Bay and to rectify the alignment of the channel in the upper bay in order to improve navigation conditions at the sharp bends which now exist at the latter locality. About two-thirds of the project for forming the 23-foot channel in Mobile Harbor has been completed.

Under date of June 7, 1904, an allotment of $50,000 was made from the emergency river and harbor act of April 28, 1904, for the purpose of maintaining the ship channel in Mobile Harbor. It is proposed to expend this money in removing shoals in the dredged cut and in keeping the channel free from sunken obstructions, reserving the available balance from previous appropriations for contingent expenses.

The recommendations made last year that funds be provided so as to permit of maintenance work in Mobile Harbor as the latter is needed, and that provision be made for the construction of dredging plant to be employed on such maintenance work, are renewed.

(2) THE REMOVAL OF SUNKEN LOGS AND SIMILAR OBSTRUCTIONS FROM THE CHANNEL IN MOBILE HARBOR.

Between November 21, 1903, and January 25, 1904, the snag boat *Black Warrior* was engaged in removing sunken trees, logs, and timbers from the channel of Mobile River between Choctaw Point and Chickasaw Creek, while between June 6 and 30, 1904, the snag boat *Demopolis* was engaged in similar work at the same locality. As a result of these operations, the channel has been kept free from dangerous obstructions. The cost of this work during the year, including repairs to the United States plant engaged on these operations, amounted to $6,083.71.

It is proposed to apply the available balance, as well as future allotments which may be provided for this purpose, to the work of maintaining a safe channel in the river and bay by the removal of logs, trees, and other obstructions. The work accomplished under this portion of the project is not permanent, as freshets and the prevalent methods of handling and storing logs and rafts cause obstructions to lodge in the stream from time to time.

(3) THE DEEPENING OF THE CHANNEL THROUGH THE OUTER BAR NEAR FORT MORGAN.

The work of widening and deepening the channel through the outer bar near Fort Morgan, for which provision was first made in the river and harbor act of June 13, 1902, was readvertised under date of July 12, 1903, and a contract for its execution was entered into with Mr. Rittenhouse Moore, of Mobile, Ala., the only bidder, at the rate of 30 cents per cubic yard, bin measurement. This contract is dated August 22, 1903, and was approved by the Chief of Engineers under date of October 20, 1903.

Work under this contract was commenced October 2, 1903, and was continued until November 10, 1903, when the contractor's dredge *Jumbo* sank and proved a total loss. On May 16, 1904, the contractor having secured additional plant, dredging operations were resumed, and at the close of the fiscal year were still in progress. Up to the latter date 100,433 cubic yards of material had been excavated from the channel and deposited in deep water in the Gulf of Mexico. On June 30, 1904, the minimum depth on the light-house range through the channel to be improved was 25 feet.

During the past year $22,238.53 has been expended in this work and operations connected therewith, and about one-quarter of the work to be performed at this locality has been accomplished.

By authority of the Chief of Engineers, the time limit on the outer bar contract, which expired March 22, 1904, was extended for such period as is deemed reasonable.

Future appropriations will be applied to the continuation of the work of securing a channel of the projected dimensions. This work can only be economically performed by the use of Government plant, and provision in future appropriations for its performance in such manner is recommended.

It is proposed to apply available funds to the continuation of work under the existing contract, and with this expenditure a depth of 27 feet will probably be obtained.

Money statements.

GENERAL IMPROVEMENT.

July 1, 1903, balance unexpended		$275,329.55
Received from sales of Government property		1,017.00
Amount allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904		47,500.00
		323,846.55
June 30, 1904, amount expended during fiscal year, for works of improvement		262,925.22
July 1, 1904, balance unexpended		60,921.33
July 1, 1904, outstanding liabilities		330.60
July 1, 1904, balance available		60,590.73
Amount (estimated) required for completion of existing project		600,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$600,000.00	
For maintenance of improvement	75,000.00	
		675,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

REMOVING OBSTRUCTIONS.

July 1, 1903, balance unexpended	$7,452.02
Amount allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904	2,500.00
	9,952.02
June 30, 1904, amount expended during fiscal year, for works of improvement	6,083.71
July 1, 1904, balance unexpended	3,868.31
July 1, 1904, outstanding liabilities	163.00
July 1, 1904, balance available	3,705.31
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	12,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

OUTER BAR.

July 1, 1903, balance unexpended	$48,830.62
June 30, 1904, amount expended during fiscal year, for works of improvement	22,238.53
July 1, 1904, balance unexpended	26,592.09
July 1, 1904, outstanding liabilities	15,907.00
July 1, 1904, balance available	10,685.09
July 1, 1904, amount covered by uncompleted contracts	7,372.00
Amount (estimated) required for completion of existing project	41,250.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	41,250.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

By act of—		
May 20, 1826	$10,000.00	
March 2, 1829	20,000.00	
June 24, 1834	10,000.00	
March 3, 1835	17,997.60	
March 3, 1837	50,000.00	
July 7, 1838	50,000.00	
August 3, 1852	50,000.00	
		$207,997.60
March 3, 1857 (relief claim)		20,833.00
July 11, 1870	50,000.00	
March 3, 1871	50,000.00	
June 10, 1872	75,000.00	
March 3, 1873	100,000.00	
June 23, 1874	100,000.00	
March 3, 1875	26,000.00	
		401,000.00
June 18, 1878 (survey)	10,000.00	
March 3, 1879	100,000.00	
June 14, 1880	125,000.00	
March 3, 1881	100,000.00	
August 2, 1882	125,000.00	
July 3, 1884	200,000.00	
August 6, 1886	90,000.00	
		750,000.00
August 11, 1888	250,000.00	
September 19, 1890	350,000.00	
July 13, 1892	212,500.00	
March 3, 1893	500,000.00	
August 18, 1894	390,000.00	
March 2, 1895	291,300.00	
March 16, 1896	160,000.00	
June 3, 1896 (maintenance)	60,000.00	
June 4, 1897 (maintenance)	25,000.00	
July 1, 1898 (maintenance)	30,000.00	
		2,268,800.00
March 3, 1899	100,000.00	
June 6, 1900	500,000.00	
June 13, 1902	300,000.00	
March 3, 1903	200,000.00	
		1,100,000.00
April 28, 1904 (maintenance—allotment)		50,000.00
June 30, 1904, from sales of Government property		1,017.00
Total		4,799,647.60

CONTRACT IN FORCE.

With Rittenhouse Moore, of Mobile, Ala., dated August 22, 1903; approved by the Chief of Engineers October 20, 1903, for dredging on the outer bar of Mobile Harbor at the rate of 30 cents per cubic yard for material removed, measured in bins; work commenced October 2, 1903; was to be completed March 22, 1904, but time of completion has been extended for such time as is deemed reasonable by the district engineer officer.

COMMERCIAL STATISTICS.

[Statistics furnished by the United States custom-house, Mobile, Ala., showing the business of the port of Mobile for the calendar year ending December 31, 1903.]

Exports	$15,146,504.00
Imports (valuation at point of shipment)	4,139,598.00
Total	19,286,102.00
Custom receipts from all sources	56,927.42

Trade.	Vessels.			
	Entered 1903.		Cleared 1903.	
	Number.	Tons.[a]	Number.	Tons.[a]
Foreign	647	489,747	692	524,890
Coastwise	144	220,484	115	170,139
Total	791	710,231	807	695,029

[a] Registered net tonnage.

Foreign commerce.

The following statement concerning the foreign commerce of the port of Mobile for the calendar year ending December 31, 1903, has been compiled from the records of the United States custom-house and from the reports of shippers, consignees, and carriers:

Articles.	Tons.	Value.
EXPORTS.		
Breadstuffs	47,324	$1,426,216
Coal and coke	[a] 11,873	35,619
Cotton	33,279	6,761,676
Hog products	9,322	1,482,262
Lumber	116,702	1,083,197
Timber	231,647	2,779,764
Manufactured goods	12,412	840,034
Live stock	4,723	292,278
Naval stores	8,290	123,388
Staves	14,327	143,270
Miscellaneous	2,010	178,800
Total	491,909	15,146,504
IMPORTS.		
Bananas	62,860	1,039,075
Cocoanuts	2,500	90,000
Sisal grass	14,188	2,881,085
Hard wood	2,540	217,368
Sulphur ore	15,458	77,290
Manganese ore	17,820	160,380
Cement	2,021	20,210
Creosote oil	4,414	44,553
Fertilizer	3,654	45,799
Miscellaneous	9,000	200,000
Total	134,455	[b] 4,775,760

[a] In addition to the above, about 200,000 tons of bunker coal, valued at $600,000, was supplied to outward-bound steamships.
[b] Valuation at point of receipt.

The following lines of steamships operate between Mobile, Ala., and foreign ports:
United Fruit Company, Central American ports.
Orr-Laubenheimer Steamship Company, Central American ports.
Camors-McConnell Steamship Company, Central American ports.
John B. Cefalu & Co., Central American ports.
Di Giorgio Importing and Fruit Company, Central American ports.
Thacker Brothers, Central American ports.
Southern Steamship Company, Central American ports.
Munson Line, Cuban ports.
Atlantic and Mexican Gulf Steamship Company, Mexican ports.
Benemelis Line, Mexican ports.
Elder-Dempster Company, United Kingdom and Continent.
International Steamship Company, all ports.

The following lines of steamships operate between Mobile, Ala., and coastwise ports:
Mallory Line, Brunswick, Ga., and New York.
Florida Cattle and Transportation Company, Florida ports.
Mobile-Tampa Steamship Company, Tampa, Fla.

Coastwise commerce.

The following statement concerning the coastwise commerce of the port of Mobile for the calendar year ending December 31, 1903, has been compiled from the records of shippers, consignees, and carriers:

Articles.	Tons.	Value.
ARRIVING.		
Phosphate	52,000	$1,000,000
Anthracite coal	4,398	35,024
Dynamite and powder	385	36,000
Cord wood	32,000	60,000
Naval stores	21,742	1,040,128
Staves	41,600	320,000
Cross-ties	20,700	87,400
Fish and oysters	154,000	2,000,000
Merchandise, general	13,000	1,820,000
Cement	1,849	19,874
Total	341,674	6,418,426
DEPARTING.		
Cotton	15,231	3,046,200
Lumber	9,133	100,000
Cross-ties	3,253	11,708
Oats	180	3,600
Timber	3,776	45,312
Turpentine	127	15,240
Miscellaneous	100,000	3,000,000
Total	131,700	6,222,060

In addition to the above, water shipments to and from Alabama and Tombigbee river points, consisting of cotton, cotton seed, logs, provisions, feed, machinery, farm supplies, and manufactured goods, amounted in 1903 to 600,000 tons, valued at $11,500,000.

Comparative statement of the number and draft of vessels passing up and down the dredged channel for the calendar years ending December 31, 1902 and 1903.

[Compiled from the books of the harbor master at Mobile, Ala.]

Draft.	Steamships.				Square-rigged vessels.			
	Up.		Down.		Up.		Down.	
	1902.	1903.	1902.	1903.	1902.	1903.	1902.	1903.
Less than 13 feet	351	484	222	306	46	37	6	4
13 to 14 feet	109	107	71	109	20	14	3	2
14 to 15 feet	48	77	98	82	13	8	4	14
15 to 16 feet	26	28	30	46	4	4	4	3
16 to 17 feet	10	11	22	26	1	....	2	1
17 to 18 feet	8	3	21	25	1	2	8	5
18 to 19 feet	9	6	29	34	....	1	10	12
19 to 20 feet	2	1	22	28	2	3	10	6
20 to 21 feet	....	6	25	17	1	2	16	9
21 to 22 feet	2	1	18	35	....	1	14	10
22 to 23 feet	1	1	8	17	....	....	11	6
Total	566	725	566	725	88	72	88	72

Draft.	Schooners.				Total.			
	Up.		Down.		Up.		Down.	
	1902.	1903.	1902.	1903.	1902.	1903.	1902.	1903.
Less than 13 feet	142	120	84	85	539	641	312	395
13 to 14 feet	2	3	15	18	131	124	89	129
14 to 15 feet	2	1	24	16	63	86	126	112
15 to 16 feet	....	....	8	3	30	32	42	52
16 to 17 feet	1	2	8	3	12	13	32	30
17 to 18 feet	1	....	5	1	10	5	34	31
18 to 19 feet	....	1	1	2	9	8	40	48
19 to 20 feet	1	....	1	....	5	4	33	34
20 to 21 feet	....	1	2	....	1	9	43	26
21 to 22 feet	....	....	1	....	2	2	33	45
22 to 23 feet	....	....	....	....	1	1	19	23
Total	149	128	149	128	803	925	803	925

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

Mobile, Ala., *June 30, 1904.*

Major: I have the honor to submit the following report of operations accomplished during the fiscal year ending June 30, 1904, in connection with the improvement of Mobile Harbor, Alabama:

As provided by the river and harbor act of June 13, 1902, available funds have been applied to the following operations:

(1) The formation of a 23-foot channel in Mobile River and Bay.

(2) The removal of sunken logs and sunken obstructions from the channel of Mobile Harbor.

(3) The widening and deepening of the channel through the outer bar near Fort Morgan.

THE FORMATION OF A 23-FOOT CHANNEL IN MOBILE RIVER AND BAY.

(*a*) *Dredging.*—Work under the National Dredging Company's contract, dated October 20, and approved November 18, 1902, was in progress at the beginning of the year. Operations were prosecuted continuously under this contract until November 11, 1903, at which time the amount of work called for by the contract had been accomplished. From July 1, 1903, to the date of completion, 2,081,897 cubic yards of material, scow measurement, were removed from the channel. The total amount of material excavated under the entire contract was 4,491,836 cubic yards, and a continuous 23-foot channel, with a width varying from 55 feet to 150 feet, was opened up within the limits of the project. Detailed information regarding the performance of this work is contained in the appended table:

Name of dredge.	Commenced work.	Completed work.	Number of working days.	Quantity dredged, scow measurement.	Average yards dredged per working day.	Total advance.	Advance per working day.
	1902.	1903.		*Cubic yards.*		*Feet.*	*Feet.*
Grapple No. 5	Nov. 25	Nov. 11	295	2,553,292	8,655	87,100	295
Hydraulic No. 5	Dec. 16	July 27	187	1,150,089	6,150	46,050	246
	1903.						
Grapple Mascot	June 16	Nov. 4	120	788,455	6,570	31,571	263
Total				4,491,836		164,721	

The sections of the channel dredged by each machine, and the resulting lengths of the various cuts, are as follows:

	Feet.	Feet.
Grapple dredge No. 5:		
From 60 feet north of beacon 14 to beacon 12–A	8,324	
From beacon 12 to 4,727 feet south of beacon 8–A	41,279	
From 600 feet north of beacon 6 to 1,963 feet south of beacon MGA	37,497	
		87,100
Hydraulic dredge No. 5:		
From above One Mile Creek to 5,135 feet south of beacon 16	40,688	
From beacon 14–A to 1,750 feet south of beacon 14–A	1,750	
From 4,388 feet south of beacon 14–A to 8,000 feet south of beacon 14–A	3,612	
		46,050
Grapple dredge Mascot:		
From 5,135 feet south of beacon 16 to beacon 14–A	3,036	
From 1,750 feet south of beacon 14–A to 4,388 feet south of beacon 14–A	2,638	
From beacon 12–A to beacon 12	8,245	
From 4,727 feet south of beacon 8–A to 600 feet north of beacon 6	17,652	
		31,571
		164,721

The total length of the dredged cut as indicated above is 164,721 feet, or about 31.2 miles.

The maximum yardage dredged in any one month was 649,034 cubic yards, removed during July, 1903, when all three machines were engaged on the work.

The maximum output of a grapple dredge was 307,611 cubic yards, scow measurement, removed by grapple dredge *No. 5* during October, 1903, while the maximum yardage removed by the hydraulic dredge was 294,669 cubic yards, scow measurement, removed during the month of June, 1903. The total number of working days occurring during the intervals when the various machines were employed on the work was 602, and the average yardage removed per machine per working day of twenty-four hours was about 7,460 cubic yards. The average output of grapple dredge *No. 5* and hydraulic dredge *No. 5* has increased since June 30, 1903, owing to the fact that a larger bucket was installed on the former dredge, while the latter machine was working, toward the close of the contract, in a heavier bank and under more favorable conditions. The average output of the grapple dredge *Mascot* has decreased since June 30, 1903, owing to the fact that while this machine was working in the vicinity of beacons 14-A and 16, a long tow to the dumping ground was necessary, thereby entailing considerable delay in waiting for scows.

Under the above contract the ship channel from above One Mile Creek, to beacon MBA, near the Mobile Bay light-house, was dredged to a least width of 100 feet, with a width of about 150 feet at bends. Below beacon MBA, cuts aggregating about 90 feet in width were dredged over the cut-off channel to beacon 8-A, while below the latter beacon a single cut about 55 or 60 feet wide was dredged to deep water in the lower bay. The minimum depth in these cuts at the close of dredging operations was 23 feet.

Recent examinations of the ship channel show that the dredged cut has maintained itself quite well except between light-house beacons 4 and 8 in the lower bay, a distance of about 27,000 feet. In this locality some shoaling has occurred, and the effective depth of the channel has thereby become reduced to 22 or 22½ feet. It is proposed to remove these shoals during the coming fiscal year with funds recently allotted from the emergency river and harbor act of April 28, 1904.

(*b*) *Tidal observations.*—The automatic tide gauge at Battery Gladden has been continued during the year and additional gauges have been installed at Fort Morgan and Grants Pass. The records obtained from the various gauges have been reduced with the following results:

	Feet.
Battery Gladden:	
Average of 485 high waters above present datum	1.71
Average of 488 low waters above present datum	.28
Average range of tide	1.43
Fort Morgan:[a]	
Average of 54 high waters above present datum	1.44
Average of 54 low waters above present datum	.42
Average range of tide	1.02
Grants Pass:[a]	
Average of 25 high waters above present datum	1.24
Average of 26 low waters above present datum	.14
Average range of tide	1.10

(*c*) *Surveys.*—Examinations of the dredged cut, cross-section surveys for the determination of the yardages excavated by the hydraulic dredge and a final survey to develop the condition of the ship channel at the close of the National Dredging Company's contract were made during the year. A complete survey of the water front of the city of Mobile from Choctaw Point to Chickasaw Creek, to serve as a basis for the establishment of harbor lines for the port was also in progress between January 28 and April 9, 1904. The maps of this survey are approaching completion at the present time.

REMOVING OBSTRUCTIONS FROM MOBILE HARBOR.

Repair work upon the snag boat *Black Warrior* was in progress until November, 1903. Upon the completion of these repairs the boat was placed in commission on Mobile Harbor and was engaged in the work of removing sunken trees, logs, and snags from the channel. This work was continued until January 25, 1904, at which time the river was in safe condition for deep-draft navigation.

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[a] Not yet definitely connected with Mobile Harbor datum.

Snagging work was resumed on June 6, 1904, with the snag boat *Demopolis*, and is still in progress. The latter operations are for the purpose of removing the obstructions which have been carried into the channel during the spring.

DREDGING ON THE OUTER BAR.

During the fiscal year 1903, no operations were in progress on the outer bar, no proposals having been received for this work in response to its public advertisement. The work was readvertised under date of July 12, 1903, and a contract for its execution was entered into on August 22, 1903, with Mr. Rittenhouse Moore, of Mobile, Ala., whose proposal was the only one received. The price paid under this contract is 30 cents per cubic yard, bin measurement.

Operations under this contract were commenced October 2, 1903, with the hydraulic dredge *Jumbo*. Work progressed until November 10, 1903, when the dredge sank while at work. As the machine proved a total loss, dredging operations were suspended until additional plant could be secured. The dredge *G. W. R. Bayley* was brought to Mobile by the contractor toward the latter part of December, 1903, but as extensive repairs were necessary to place this machine in a safe working condition dredging operations could not be resumed until May 16, 1904. Since the resumption of operations, various additional repairs to the machine have become necessary, and but little progress has been effected in the past seven months. The total yardage excavated to date is 100,433 cubic yards, and the minimum depth in the channel on the light-house range is 25 feet.

Respectfully submitted.

David G. Anderson,
Assistant Engineer.

Maj. W. E. Craighill,
Corps of Engineers.

R 2.

IMPROVEMENT OF BLACK WARRIOR, WARRIOR, AND TOMBIGBEE RIVERS, ALABAMA AND MISSISSIPPI.

PROJECT FOR BLACK WARRIOR, WARRIOR, AND TOMBIGBEE RIVERS, ALABAMA.

To afford a channel for 6-foot navigation from the junction of the Mulberry and Locust forks of the Black Warrior River to the mouth of the Tombigbee River, a distance of 362 miles, by the construction of locks and dams and other necessary work. Locks are to be 52 feet wide and 322 feet between gates, giving an available length of 285 feet; minimum depth of water on miter sills, 6½ feet, and 7 feet in lock chambers and approaches.

(A) BLACK WARRIOR RIVER.

[Above Tuscaloosa, Ala.]

The following work was done by the contractors at Lock No. 4 (to be known as 13 when completed) during the year:

Quoins	cubic yards	9
Coping	do	230
Pointed-face masonry	do	97
Rock-face masonry	do	61
Rubble masonry	do	2,534
Dry rubble masonry	do	7
Excavation	do	3,094
Rock excavation	do	956
Embankment	do	3,410
Stone filling	do	605

Paving	cubic yards	472
Riprap, hand-placed	do	666
Bolt holes, in masonry	linear feet	196
Miter sills	feet B. M.	5,000
Framed timber	do	41,248

A spur telephone line 2 miles long was built with hired labor to connect Lock 4 with lines of Southern Bell Telephone and Telegraph Company, and a survey was made to determine the location and cost of Locks 14 and 15.

PRESENT CONDITION OF WORK.

Three locks completed, one lock 95 per cent finished, and 7 locks not begun. Survey for two of these locks completed.

GATES AND VALVES.

Gates and valves for Lock 4 were built with hired labor at the Tuscaloosa shops and are stored ready for erection whenever the contract work is sufficiently advanced.

PROPOSED APPLICATION OF FUNDS.

With available funds it is proposed to complete work on Lock and Dam No. 4, and with future appropriations to carry the work of lock and dam construction on up the river.

NAVIGATION AND COMMERCE.

The bulk of the traffic on this part of the river passes through Locks 10, 11, and 12, and is given in detail in the report on operating and care of locks and dams, Black Warrior River, Alabama. In addition to this there is a small traffic in coal and timber on the pool above Lock 3, statistics of which are not available.

(B) WARRIOR RIVER.

[Below Tuscaloosa, Ala.]

WORK OF THE PAST YEAR.

Work on Locks 1, 2, and 3, which was commenced in May, 1903, under contract with M. T. Lewman & Co., of Louisville, Ky., dated April 1, 1903, and approved April 22, 1903, was continued, and during the past fiscal year the following was accomplished:

		Lock 1.	Lock 2.	Lock 3.
Excavated material	cubic yards	46,960	50,431	49,391
Concrete	do	1,897	....	....
Gravel filling	do	28	....	....
Cofferdam timber	feet B. M.	173,161	200,304	212,360
Sheet piling	do	....	2,936	....
Foundation piles, delivered	linear feet	436	4,937	28,306
Foundation piles, driven	do	751	4,727	....
Drain pipe	do	108	....	....
Placing valves and special irons	pounds	14,791	....	....

On June 30, 1904, contract work at Lock 1 was about 18 per cent completed, at Lock 2 about 13 per cent, and at Lock 3 about 15 per cent. During the fiscal year contract work was completed on Lock 4 and the lock turned over to the Government. The following is a statement of the contract work performed on this lock during the year:

Concrete	cubic yards	349
Excavation	do	13,292
Gravel filling	do	1,673
Stone filling	do	2,011
Riprap, hand placed	do	2,439
Dam timber	feet B. M.	175,009
Apron timber	do	33,388
Sheet piling	do	12,896
Foundation piles	linear feet	82
Foundation piles, cut off above grade	do	24
Heart piles, not squared	do	805
Grubbing and clearing	per cent	10

GATES AND VALVES.

During the fiscal year erection of gates at Locks 4 and 5 was completed. Material for the construction of the gates for Locks 1, 2, and 3 was purchased and delivered at the Tuscaloosa shops, where they are being built with hired labor. These gates are to be erected by the contractors who are building the locks. The valves have been delivered at the locks and part of those for Lock 1 have been placed.

HOUSES.

Engineer quarters at Locks 1 and 2, and lock tender's house at Lock 3, have been built by contract and turned over to the United States. These houses are now used as offices and quarters by the United States inspectors employed on the work.

TELEPHONE LINES.

Three spur telephone lines, with a total length of about 12½ miles, have been built with hired labor to connect Locks 4, 5, and 6 (now known as Locks 7, 8, and 9, Black Warrior River) with lines of Southern Bell Telephone and Telegraph Company.

MAINTENANCE.

Snagging operations on the Warrior River, which were commenced on May 27, 1903, and which were in progress at the beginning of the present fiscal year, were continued until October 3, 1903, when work was suspended for the season. These operations were carried on with the U. S. snag boat *Demopolis* and hired labor, and resulted in placing the channel of the Warrior River from Lock 7 down to the mouth at Demopolis, a distance of about 52 miles, in a safe condition for navigation.

PRESENT CONDITION OF WORK.

Three locks completed and in operation and three locks being constructed under continuing contract.

PROPOSED APPLICATION OF FUNDS.

With available funds and additional appropriations, it is proposed to complete building Locks and Dams 1, 2, and 3.

NAVIGATION AND COMMERCE.

A portion of the traffic on this stream passed Locks 7, 8, and 9, and is given in detail in the report on operating and care of locks and dams, Black Warrior River, Alabama. In addition to this there was some navigation and rafting on that portion of the river below Lock 7, statistics for which are not available.

(C) TOMBIGBEE RIVER.

WORK OF THE PAST YEAR.

Operations were largely confined to a survey to determine the cost of completing Lock 1, the location and cost of constructing Locks 2 and 3, and the amount and cost of necessary dredging.

PRESENT CONDITION OF WORK.

One lock is about two-thirds completed, and two locks and the work of dredging have not yet been commenced. The survey has been completed.

For commercial statistics for the calendar year ending December 31, 1903, see report on Tombigbee River, mouth to Demopolis.

GENERAL.

In order to open navigation from tide water to the Warrior coal fields and to make available the work already done in the rivers, provision should be made for the immediate completion of Lock and Dam No. 1, Tombigbee River (at McGrews shoals), and for putting under contract the remaining two locks and dams on this river. This, with the works already completed or in progress, will provide continuous slack-water navigation from Mobile to a point about 13 miles above Tuscaloosa. In addition, two more locks and dams above Tuscaloosa should be provided for in order to extend navigation 25 miles into the coal fields. For reasons of economy, contracts should be authorized for the completion of the locks and dams named above.

Money statements.

BLACK WARRIOR RIVER, GENERAL PROJECT.

July 1, 1903, balance unexpended	$53,213.61
June 30, 1904, amount expended during fiscal year, for works of improvement	27,150.47
July 1, 1904, balance unexpended	26,063.14
July 1, 1904, outstanding liabilities	9,522.53
July 1, 1904, balance available	16,540.61
July 1, 1904, amount covered by uncompleted contracts	6,500.00
Amount (estimated) required for completion of existing project	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	250,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

BLACK WARRIOR RIVER, SURVEY.

July 1, 1903, balance unexpended	$3,000.00
June 30, 1904, amount expended during fiscal year, for works of improvement	2,413.58
July 1, 1904, balance unexpended	586.42

WARRIOR RIVER, GENERAL PROJECT.

July 1, 1903, balance unexpended	$568,783.43
Received from sales of Government property	23.40
Amount appropriated by sundry civil act approved April 28, 1904	225,000.00
	793,806.83
June 30, 1904, amount expended during fiscal year, for works of improvement	190,977.30
July 1, 1904, balance unexpended	602,829.53
July 1, 1904, outstanding liabilities	21,395.00
July 1, 1904, balance available	581,434.53
July 1, 1904, amount covered by uncompleted contracts	604,241.00
Amount (estimated) required for completion of existing project	[a]93,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	93,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

WARRIOR RIVER, TUSCALOOSA TO DEMOPOLIS, MAINTENANCE.

July 1, 1903, balance unexpended	$6,020.80
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	3,328.85
July 1, 1904, balance unexpended	2,691.95
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	10,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

TOMBIGBEE RIVER, ALABAMA, SURVEY.

July 1, 1903, balance unexpended	$1,883.28
June 30, 1904, amount expended during fiscal year, for works of improvement	1,839.85
July 1, 1904, balance unexpended	43.43

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[a] Balance necessary to complete appropriations to the amount of $1,534,000, the estimated cost of the Warrior River project	$75,000.00
Amount diverted from appropriation of June 13, 1902, for maintenance of Warrior River from Tuscaloosa to Demopolis	10,000.00
Amount diverted for survey to determine location of lock sites in Tombigbee River	8,000.00
	93,000.00

TOMBIGBEE RIVER, MOUTH TO DEMOPOLIS, GENERAL PROJECT.

Received from sale of Government property	$175.00
June 30, 1904, amount expended during fiscal year, for works of improvement	162.00
July 1, 1904, balance unexpended	13.00
July 1, 1904, outstanding liabilities	13.00
Amount (estimated) required for completion of existing project	1,200,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	400,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

Black Warrior River.

By act of—		
July 5, 1884	$50,000.00	
August 1, 1886	56,250.00	
August 11, 1888	100,000.00	
September 19, 1890	150,000.00	
July 13, 1892	200,000.00	
August 18, 1894	37,500.00	
June 3, 1896	10,000.00	
March 3, 1899	50,000.00	
June 6, 1900	86,824.00	
March 3, 1901	53,676.00	
Amount transferred from Warrior River appropriation by act of June 13, 1902	14,000.00	
	808,250.00	
June 30, 1904, from sales Government property	183.42	
		$808,433.42

Warrior and Tombigbee rivers.

By act of—		
March 3, 1875	25,000.00	
August 14, 1876	15,000.00	
June 18, 1878	28,000.00	
March 3, 1879	20,000.00	
		88,000.00

Warrior River.

PREVIOUS PROJECTS.

By act of—		
June 14, 1880	20,000.00	
March 3, 1881	10,622.00	
August 2, 1882	10,000.00	
July 5, 1884	12,000.00	
August 5, 1886	18,750.00	
August 11, 1888	18,000.00	
September 19, 1890	45,000.00	
July 13, 1892	75,000.00	
August 18, 1894	40,000.00	
June 3, 1896	70,000.00	
		319,372.00

EXISTING PROJECT.

March 3, 1899		$220,000.00	
June 6, 1900		200,000.00	
June 6, 1900 (emergency act—allotted)		3,691.24	
March 3, 1901		240,000.00	
June 13, 1902		374,000.00	
March 3, 1903		200,000.00	
April 28, 1904		225,000.00	
		1,462,691.24	
Less amount transferred to Black Warrior River by act of June 13, 1902	$14,000		
Amount diverted for survey for location of lock sites in Tombigbee River, as authorized by act of June 13, 1902	8,000		
		22,000.00	
		1,440,691.24	
June 30, 1904, from sales Government property		206.82	
			$1,440,898.06
Tombigbee River.			
By act of—			
June 13, 1892		[a]50,000.00	
August 18, 1894		[a]50,000.00	
June 3, 1896		[a]50,000.00	
March 3, 1899		50,000.00	
Amount diverted from Warrior River appropriation for survey for location of lock sites, as directed by act of June 13, 1902		8,000.00	
		208,000.00	
June 30, 1904, from sales Government property		175.00	
			208,175.00
Total			2,864,878.48

CONTRACTS IN FORCE.

With Willard & Cornwell, dated September 28, 1899, approved by the Chief of Engineers November 2, 1899, for the construction of Lock and Dam No. 4, Black Warrior River, Alabama, for $163,348. Work commenced November 20, 1899; continuing contract; was to be completed by December 31, 1902, the time having been extended for one year, but time of completion has since been extended for such period as is deemed advisable by the district engineer officer.

With M. T. Lewman & Co., dated April 1, 1903, approved by the Chief of Engineers April 22, 1903, for the construction of Locks and Dams Nos. 1, 2, and 3, Warrior and Tombigbee rivers, Alabama, for $266,414, $215,641, and $235,436, respectively. Work commenced early in May, 1903; continuing contract; to be completed by October 1, 1905.

(D) TOMBIGBEE RIVER, MOUTH TO DEMOPOLIS.

The existing project for this improvement, as modified by the river and harbor act of June 13, 1902, provides for the maintenance of the channel obtained under earlier appropriations, between the mouth of the Tombigbee River and Demopolis, a distance of 185 miles, by the removal of obstructions from the channel, the cutting of overhanging trees on the banks, and by the repair of dikes.

During the past year snagging operations were in progress between July 1 and August 31, 1903, and between October 1 and December 12,

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[a] Portions of Tombigbee River appropriation applied to work of lock and dam construction.

1903. During the former period this improvement was prosecuted with the snagboat *Tombigbee*, while during the latter interval the snagboat *Demopolis* was employed.

The cost of this work during the year, including necessary repairs to working plant, was $4,323.57. As a result of this expenditure the channel within the limits of the project was placed in a safe condition for navigation on a slight rise above low water.

This improvement is not permanent, owing to the obstructions which are brought into the channel during high-water stages.

It is proposed to apply the existing balance to the preservation and care of working property, and to devote future appropriations to the work of maintaining a navigable channel within the limits of this improvement.

Money statement.

July 1, 1903, balance unexpended	[a]$4,585.98
Received from sales of Government property	43.44
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	4,000.00
	8,629.42
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	4,323.57
July 1, 1904, balance unexpended	4,305.85
July 1, 1904, outstanding liabilities	60.00
July 1, 1904, balance available	4,245.85
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	30,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Previous projects.

By act of—

June 10, 1872	$5,332.95
June 14, 1880 (below Vienna)	15,000.00
March 3, 1881 (below Vienna)	7,988.00
August 2, 1882 (below Vienna)	12,500.00
July 5, 1884 (below Vienna)	15,000.00
August 5, 1886 (below Vienna)	11,250.00
August 11, 1888 (below Vienna)	6,000.00
September 19, 1890	55,000.00
July 13, 1892	[b]75,000.00
August 18, 1894	[b]25,000.00
June 3, 1898	[b]25,000.00
Allotted from emergency act June 6, 1900	3,980.81
	257,051.76

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[a] Erroneously reported as $4,556.73 in annual report for 1903.

[b] Portions of Tombigbee River appropriations applied to snagging work.

Existing projects.

By act of—		
June 13, 1902 (allotment)	$16,000.00	
Allotted from act of June 13, 1902	4,000.00	
		$20,000.00
June 30, 1904, from sales Government property		72.69
Total		277,124.45

COMMERCIAL STATISTICS.

Commerce on the Tombigbee River, mouth to Demopolis, during the calendar year ending December 31, 1903, consisted of cotton, cottonseed, logs, timber, breadstuffs, fertilizers, farm supplies, provisions, and general merchandise. The amount of this commerce was about 225,000 tons, valued at about $4,000,000.

(E) DEMOPOLIS TO COLUMBUS.

During the past fiscal year the snagboat *Vienna* was engaged in the work of removing obstructions from the channel of the Tombigbee River from Demopolis to Columbus between July 1 and December 26, 1903. During this time the entire river within the limits of the project was worked over and placed in such condition that the stream was available for navigation on a slight rise above low water. The amount expended on this work during the year was $6,332.75. This expenditure was for maintenance entirely, the commencement of the projected lock and dam work never having been authorized. The work of maintenance requires attention every year, owing to the obstructions which are carried into the stream by high-water stages.

It is proposed to apply the existing balance to the preservation and care of working property, and to devote future appropriations to the work of maintaining a navigable channel within the limits of this improvement.

Money statement.

July 1, 1903, balance unexpended	$6,456.34
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	6,332.75
July 1, 1904, balance unexpended	123.59
July 1, 1904, outstanding liabilities	60.00
July 1, 1904, balance available	63.59
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	20,000.00

APPROPRIATIONS.

By act of—	
June 14, 1880 (Columbus to Vienna)	$12,000
March 3, 1881 (Columbus to Vienna)	6,390
August 2, 1882 (Vienna to Fulton)	7,500
July 5, 1884 (Vienna to Fulton)	10,000
August 5, 1886 (Vienna to Fulton)	7,500
August 11, 1888 (Vienna to Fulton)	6,500
September 19, 1890	15,000
July 13, 1892	35,000
August 18, 1894	50,000
June 3, 1896	50,000
March 3, 1899	10,000
Total	209,890

COMMERCIAL STATISTICS.

Commerce on the Tombigbee River from Demopolis to Columbus during the calendar year ending December 31, 1903, consisted of cotton, cotton seed, logs, breadstuffs, fertilizers, farm supplies, provisions, and general merchandise. The amount of this commerce was about 30,000 tons, valued at about $500,000.

(F) COLUMBUS TO WALKERS BRIDGE.

In accordance with the provisions of the river and harbor act of June 13, 1902, an allotment of $4,000 was made from the appropriation for Tombigbee River, mouth to Demopolis, for the work of improving this stream from Columbus to Walkers Bridge. Operations in connection with this improvement were commenced on June 1, 1903, at Aberdeen, Miss.

During the past fiscal year snagging operations on this section of the Tombigbee River were in progress from July 1 to December 5, 1903, work being suspended on the latter date owing to lack of funds. In this interval a distance of about 74 miles of river was worked over, making a total distance of about 90 miles worked over with the funds allotted in 1902. The expenditures during the year amounted to $2,705.23. At the close of operations the river above Aberdeen, Miss., was in fair condition for rafting on a rise of several feet above low water.

It is proposed to apply the existing balance to the preservation and care of working property, and to devote future appropriations to the work of maintaining a navigable channel within the limits of this improvement.

Money statement.

July 1, 1903, balance unexpended	$3,033.21
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	2,705.23
July 1, 1904, balance unexpended	327.98
July 1, 1904, outstanding liabilities	60.00
July 1, 1904, balance available	267.98
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	10,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

For Tombigbee River above Columbus:		
By act of—		
June 10, 1872	$4,667.05	
June 18, 1878	12,000.00	
March 3, 1879	10,000.00	
March 14, 1880	4,000.00	
March 3, 1881	1,000.00	
		$31,667.05
For Tombigbee River, Fulton to Columbus:		
By act of—		
July 13, 1892	6,000.00	
August 18, 1894	4,000.00	
June 3, 1896	8,000.00	
March 3, 1899	5,000.00	
		23,000.00
For Tombigbee River, Walkers Bridge to Fulton:		
By act of—		
August 11, 1888	4,000.00	
September 19, 1890	4,000.00	
July 13, 1892 (maintenance)	3,000.00	
August 18, 1894 (maintenance)	1,000.00	
June 3, 1896 (maintenance)	1,000.00	
March 3, 1899 (maintenance)	1,000.00	
		14,000.00
For Tombigbee River, Columbus to Walkers Bridge:		
By act of June 13, 1902 (allotment)		4,000.00
Total		72,667.05

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1903.

Articles.	1903.	
	Tons.	Value.
Logs and timber	150,000	$350,000

R 3.

OPERATING AND CARE OF LOCKS AND DAMS ON BLACK WARRIOR RIVER, ALABAMA.

LOCKS 7, 8, 9, 10, 11, AND 12, BLACK WARRIOR RIVER, ALABAMA.

GENERAL CONDITION OF LOCKS.

Lock 7 was completed and opened for traffic in November, 1903; Lock 8 opened for traffic in October, 1903, and Lock 9 has been in operation since October, 1902. These locks are in fair condition, though additional riprap for bank protection and additional filling below dams is needed to check erosion. Locks 10, 11, and 12 were completed and opened for traffic in November, 1895, and are in fair condition.

WORK OF PAST YEAR.

Lock 7 (*formerly Lock 4, Warrior River*).—Contract work was completed, the lock turned over to the United States, gate erection by hired labor completed, and the lock opened for traffic during November, 1903. Heavy stone has been placed on the dam apron and small stone placed below the apron, along the face of the abutment, and along the back of the river lock wall to prevent erosion. Riprap has been extended up the bank slope of the lower lock approach; 1,118 tons of heavy stone, 1,249 tons of small stone, and 159 tons of quarry waste have thus been used since July 1, 1903. Some filling has been placed above dam and abutment and some dredging has been done in the lower lock approach.

Lock 8 (*formerly Lock 5, Warrior River*).—Contract work was completed, and this lock turned over to the United States in December, 1902. Owing to failure to complete the erection of gates before the winter floods set in, and because the timber floor of lock was lifted by upthrust in November, 1902, this lock was not opened to traffic until October, 1903. Lock chamber was pumped out and extensive repairs, involving the driving of 797 new piles, made to lock floor.

A large leak which developed under abutment during July, 1903, was repaired by using about 25,000 sand bags and several barge loads of brush, stone, and quarry waste. This leak caused abutment to settle and move toward river. To prevent further movement, a log crib 22 feet by 60 feet by 6 feet deep, filled with stone, was built against river face of lower abutment wing. A large amount of small stone and an apron of heavy stone about 15 feet wide was placed below dam to check erosion. Berm around lock mound protected with riprap and quarry waste. Riprap bank protection repaired and extended. One thousand and fifty-six tons of heavy stone, 3,030 tons of small stone, and 2,873 tons of quarry waste used at this lock since July 1, 1903. Willows planted on bank above and below lock mound to prevent erosion. New guard cluster of 20 piles driven at upper end of lock approach.

Lock 9 (*formerly Lock 6, Warrior River*).—Apron of heavy stone about 40 feet wide has been completed below dam, some stone, quarry waste, and gravel filling placed above dam. Two thousand nine hundred and ninety-six tons of heavy stone, 400 tons of small stone, 293 tons of quarry waste, and 80 tons of gravel have been placed at this lock since July 1, 1903. A new guard cluster of 18 piles has been driven at the upper end of lock approach.

Locks 10, 11, and 12 (*formerly Locks 1, 2, and 3*).—Quarry waste has been placed above dams to reduce leakage. Locks 10 and 11 have been pumped out, gates and other steel work painted, and necessary repairs made to valves, etc. Four thousand five hundred and seventy cubic yards of flood deposit and other material dredged from lock approaches and channel below Lock 10. Part of wreck of steamer *Daisy*, which formed an obstruction to navigation, has been removed from high-water channel below Lock 10.

About 13,589 tons of stone and quarry waste have been quarried near Tuscaloosa and towed to the six locks. A new quarter boat, at a cost of $2,196, and new dredge hull, at a cost of $2,053, have been built, dredging machinery and gravel screen fitted up, a pile driver rebuilt, steamer *Mills* and launch *Mamie* repaired and painted, and repairs made to other plant.

Statement of expenditures for operating and caring for Locks 7, 8, 9, 10, 11, and 12, Black Warrior River, Alabama, during the fiscal year ending June 30, 1904, submitted in accordance with Circular No. 12, Office Chief of Engineers, dated July 31, 1897.

Items.	Allotted.	Expended.	Balance.	Minus balance.
Salaries assistant engineer, lockmaster, and lockmen	$9,360.00	$7,556.99	$1,803.01	
Extra labor	1,500.00	1,423.84	76.16	
Riprap bank protection	6,000.00	3,311.46	2,688.54	
Stone paving below dams	18,000.00	10,268.42	7,731.58	
Removing flood deposits from locks and approaches	5,000.00	1,454.29	3,545.71	
Filling above dams	2,000.00	46.78	1,953.22	
Repairs to floor at Lock 8	7,000.00	10,187.93		$3,187.93
Pumping and bailing for repairs	1,500.00	2,817.71		1,317.71
Painting gates and valves	2,000.00		2,000.00	
Constructing quarter boat	2,000.00	2,196.26		196.26
Constructing dredge hull	2,000.00	2,053.82		53.82
Tools and plants	3,000.00	3,727.90		727.90
Fuel, lights, and oil	1,000.00	1,429.62		429.62
Telephone service and maintenance	500.00	96.36	403.64	
Incidentals	1,140.00	1,140.00		
Outstanding liabilities	8,600.00	8,600.00		
Repairing break at Lock 8		13,568.00		13,568.00
Extra allotment	10,000.00	1,224.78	8,775.22	
Total	80,600.00	71,104.16	28,977.08	19,481.24

Money statement.

July 1, 1903, balance unexpended	$21,192.67
Amount allotted during fiscal year	59,407.33
	80,600.00
June 30, 1904, amount expended during fiscal year	71,104.16
July 1, 1904, balance unexpended	9,495.84
July 1, 1904, outstanding liabilities	2,615.84
July 1, 1904, balance available	6,880.00

COMMERCIAL STATISTICS.

Traffic.

Vessels, etc.	Lock No. 7.			Lock No. 8.			Lock No. 9.		
	Ascending.	Descending.	Total.	Ascending.	Descending.	Total.	Ascending.	Descending.	Total.
Passenger boats	1	1	2						
Towboats	10	10	20	10	10	20	11	11	22
Government boats				13	13	26	37	37	74
Coal barges	1	1	2	1	1	2	1	1	2
Other barges	19	25	44	20	23	43	19	19	38
Government barges	4	6	10	41	39	80	95	90	185
Government small craft.	1	1	2	3	3	6	97	98	195
Small craft	9	14	23		5	5	1	8	9
Rafts		2	2		1	1			
Total	45	60	105	88	95	183	261	264	525
Passengers					4	4	40	16	56
Lockages	24	40	64	35	43	78	108	122	230

Traffic—Continued.

Vessels, etc.	Lock No. 10.			Lock No. 11.			Lock No. 12.		
	Ascending.	Descending.	Total.	Ascending.	Descending.	Total.	Ascending.	Descending.	Total.
Towboats	66	67	133	129	129	258	130	130	260
Government boats	36	35	71	45	44	89	44	44	88
Coal barges	11	12	23	11	12	23	11	12	23
Other barges	109	116	225	112	120	232	179	180	359
Government barges	106	97	203	112	112	224	104	101	205
Government small craft	6	6	12	84	87	171	62	66	128
Small craft	4	10	14	13	10	23	31	18	49
Rafts	4		4	4	4	8	3	4	7
Total	342	343	685	510	518	1,028	564	555	1,119
Passengers				315	362	677	350	507	857
Lockages	137	139	276	266	273	539	256	257	513

Commerce.

[In tons.]

Lock and date.	Coal.	Corn.	Oil.	Flour.	Sugar.	Cotton.	Cotton seed.	Stone.
Lock No. 7.								
December, 1903								150
January, 1904						42		
February, 1904	40			32		25	40	
March, 1904		20	1		2	1	124	
April, 1904								1,532
May, 1904								75
June, 1904								510
Total	40	20	1	32	2	68	164	2,267
Lock No. 8.								
October, 1903	285							893
November, 1903								2,224
December, 1903								1,891
January, 1904								
February, 1904	50			32		25	82	
March, 1904	30					1	194	
April, 1904							16	1,532
May, 1904								517
June, 1904								
Total	365			32		26	292	7,057

Lock and date.	Cotton-seed meal.	Fertilizer.	Oats.	Logs.	Lumber.	General and miscellaneous.	Total.
Lock No. 7.							
December, 1903							150
January, 1904							42
February, 1904	366	30				11	544
March, 1904	70	222	2			4	446
April, 1904	3			263		4	1,802
May, 1904						10	85
June, 1904							510
Total	439	252	2	263		29	3,579
Lock No. 8.							
October, 1903					50	4	1,232
November, 1903						15	2,239
December, 1903						91	1,982
January, 1904							
February, 1904	341					34	564
March, 1904						247	472
April, 1904	5			113		4	1,670
May, 1904						10	527
June, 1904							
Total	346			113	50	405	8,686

Commerce—Continued.

Lock and date.	Coal.	Corn.	Cotton.	Cotton seed.	Stone.	Cotton-seed meal.
Lock No. 9.						
July, 1903					662	
August, 1903	295				1,974	
September, 1903	472				548	
October, 1903	285				2,088	
November, 1903					2,010	
December, 1903					2,325	
January, 1904					463	
February, 1904	65		75	50		70
March, 1904		2		30	564	30
April, 1904					967	
May, 1904					517	
June, 1904						
Total	1,117	2	75	80	12,118	100
Lock No. 10.						
July, 1903	250				1,444	
August, 1903	295				2,671	
September, 1903	431				1,815	
October, 1903	255				1,877	
November, 1903					1,857	
December, 1903					2,313	
January, 1904	100				756	
February, 1904	100					
March, 1904					566	
April, 1904					967	
May, 1904	45				517	
June, 1904						
Total	1,476				14,783	

Lock and date.	Fertilizer.	Logs.	Lumber.	Sand and gravel.	General and miscellaneous.	Total.
Lock No. 9.						
July, 1903			60			722
August, 1903					1	2,270
September, 1903			125		20	1,165
October, 1903			100		5	2,478
November, 1903					15	2,025
December, 1903					88	2,413
January, 1904					25	488
February, 1904	65				4	329
March, 1904	475				1	1,102
April, 1904		113			4	1,084
May, 1904				80	10	607
June, 1904						
Total	540	113	285	80	173	14,683
Lock No. 10.						
July, 1903			195		8	1,897
August, 1903		630	6			3,602
September, 1903			75	440		2,761
October, 1903				615		2,747
November, 1903				445		2,302
December, 1903				145		2,458
January, 1904		8		80		944
February, 1904						100
March, 1904						566
April, 1904						967
May, 1904						562
June, 1904						
Total		638	276	1,725	8	18,906

Commerce—Continued.

Lock and date.	Coal.	Stone.	Logs.	Lumber.	Sand and gravel.	General and miscellaneous.	Total.
Lock No. 11.							
July, 1903	253	1,444	....	85	....	23	1,805
August, 1903	295	2,671	636	46	....	34	3,682
September, 1903	466	1,815	....	....	440	37	2,758
October, 1903	255	1,877	....	24	615	25	2,796
November, 1903	....	1,857	27	15	445	9	2,353
December, 1903	....	2,313	....	....	145	....	2,458
January, 1904	225	756	14	....	80	....	1,075
February, 1904	100	....	....	....	....	....	100
March, 1904	75	566	....	....	....	25	666
April, 1904	....	967	....	....	....	....	967
May, 1904	45	517	....	....	....	....	562
June, 1904	138	....	....	....	....	....	138
Total	1,852	14,783	677	170	1,725	153	19,360
Lock No. 12.							
July, 1903	253	1,444	....	85	290	23	2,095
August, 1903	295	2,671	636	46	434	34	4,116
September, 1903	466	1,815	....	....	633	37	2,951
October, 1903	255	1,966	....	24	615	25	2,885
November, 1903	....	2,519	27	15	445	9	3,015
December, 1903	....	1,651	....	....	145	....	1,796
January, 1904	180	756	....	....	....	....	936
February, 1904	145	....	....	....	80	....	225
March, 1904	75	566	....	....	....	25	666
April, 1904	125	967	....	....	....	....	1,092
May, 1904	138	517	....	....	....	....	655
June, 1904	....	....	....	....	....	....	....
Total	1,932	14,872	663	170	2,642	153	20,432

Comparative table of commerce through locks.

LOCK NO. 10.

Items.	Fiscal year ending June 30—							
	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
VESSELS.								
Steamboats ....number..	67	233	172	71	94	59	305	204
Barges ....do....	89	403	118	87	180	131	420	451
Steamboats ....tonnage..	(*a*)	6,165	3,655	1,892	3,135	3,621	18,345	18,693
Barges ....do....	(*a*)	29,032	5,770	5,465	19,265	12,884	24,990	30,930
Passengers ....number..	58	203	348	36	28	....	101	....
Lockages ....do....	228	537	220	119	199	118	434	276
FREIGHT CARRIED.								
Coal ....tons..	1,925	2,223	1,059	615	3,305	240	3,860	1,476
Corn ....do....	....	....	....	....	12	....	....	....
Cotton ....do....	....	....	....	38	....	....	....	....
Hay ....do....	....	....	....	....	10	....	....	....
Steel rails ....do....	....	....	....	28	....	....	2	....
Cement ....do....	....	....	88	22	....	....	....	....
Stone ....do....	....	5,076	....	....	2,082	3,938	13,096	14,783
Sand and gravel ....do....	....	148	....	....	128	45	256	1,725
Oats ....do....	....	....	....	....	18	....	....	....
Cross-ties ....do....	....	113	....	....	....	....	....	....
Hewn timber ....do....	....	5,264	....	....	....	....	....	....
Logs ....do....	149	4	342	138	....	87	533	638
Lumber ....do....	81	352	182	596	1,701	525	313	276
General and miscellaneous...do....	14	111	90	219	293	255	106	8
Total	2,169	13,291	1,761	1,656	7,549	5,090	18,166	18 906

a No record kept.

Comparative table of commerce through locks—Continued.

LOCK NO. 11.

Items.	Fiscal year ending June 30—							
	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
VESSELS.								
Steamboats ....number..	294	633	297	104	371	263	653	347
Barges.......................do....	235	439	147	105	162	268	464	479
Steamboats................tonnage..	(a)	13,985	6,431	2,657	9,111	8,708	27,007	24,138
Barges.......................do....	(a)	33,590	7,800	6,750	21,479	24,312	27,220	32,485
Passengers................number..	1,342	2,994	721	71	1,275	494	1,750	677
Lockages.....................do....	584	774	354	208	506	455	931	539
FREIGHT CARRIED.								
Coal ....tons..	4,706	4,139	1,269	707	3,945	450	4,211	1,852
Corn.........................do....		25			12			
Cotton.......................do....				38				
Hay ....do....					10			
Steel rails ....do....		22		20				
Cement......................do....		9	88	22				
Stone ....do....		5,210			1,277	6,320	13,096	14,783
Sand and gravel.............do....		148			68	45	202	1,725
Oats ....do....					18			
Posts ....do....		14						
Cross-ties ....do....		113						
Hewn timber.................do....		5,527						
Logs.........................do....	165	16	392	138		87	533	677
Lumber ....do....	146	514	346	626	1,713	805	154	170
General and miscellaneous...do....	44	320	110	285	430	157	206	153
Total.........................	5,061	16,057	2,205	1,836	7,473	7,864	18,402	19,360

LOCK NO. 12.

VESSELS.								
Steamboats ....number..	309	636	308	111	473	471	662	348
Barges.......................do....	211	474	151	110	271	543	679	587
Steamboats................tonnage..	(a)	13,582	6,729	2,948	11,635	13,987	27,196	24,284
Barges.......................do....	(a)	35,790	8,060	7,020	28,430	38,942	35,950	36,000
Passengers................number..	1,538	3,089	732	111	1,482	828	1,911	857
Lockages.....................do....	551	815	372	228	614	660	901	513
FREIGHT CARRIED.								
Coal ....tons..	4,699	4,618	1,456	757	4,255	625	4,211	1,932
Corn.........................do....		25			12			
Cotton.......................do....				38				
Hay ....do....					10			
Steel rails ....do....		22		20				
Cement......................do....		9	88	22				
Stone.........................do....		5,290			1,804	9,314	13,096	14,872
Sand and gravel ....do....		148			845	1,819	2,001	2,642
Oats ....do....					18			
Posts ....do....		14						
Cross-ties ....do....		113						
Hewn timber.................do....		5,728						
Logs.........................do....	178	74	332	138		87	590	663
Lumber ....do....	139	514	346	626	1,718	805	154	170
General and miscellaneous...do....	44	320	110	285	487	170	218	153
Total.........................	5,060	16,875	2,332	1,886	9,149	12,820	20,270	20,432

[a] No record kept.

R 4.

IMPROVEMENT OF PASCAGOULA RIVER, MISSISSIPPI.

Accounts of this improvement are contained in the Annual Reports of the Chief of Engineers for 1900, page 2211 and 1902, page 1305.

The river and harbor act of June 13, 1902, modified the existing project for this improvement by increasing the depth to be obtained in the channel from 12 feet at mean low water to 17 feet at the same stage of tide.

The contract for the work of dredging in the Pascagoula River under the modified project with funds appropriated and authorized by the act of 1902 was entered into with Mr. George W. Catt, of New York, N. Y., under date of January 12, 1903. This contract provides for the formation of a narrow channel about 15 feet deep at low water within the limits of the project, the prices to be paid under this contract being 17 cents per cubic yard, place measurement, for work in the river section, and 15 cents per cubic yard, scow measurement, for work in the Mississippi Sound section.

Work under the above contract was commenced on July 7, 1903, and completed on June 16, 1904.

In section 2, the grapple dredge *Craighill* excavated 376,249 cubic yards of material, scow measurement, and formed a channel 15 feet deep, 95 feet wide, and 22,275 feet long. In section 1, hydraulic dredge *No. 5* excavated 364,391 cubic yards of material and formed through the various shoals in this section channels with a depth of 15 feet, widths varying from 100 feet in the lower portion of the section to 75 feet in the upper portion, and with an aggregate length of 27,344 feet. This machine also excavated about 40,618 cubic yards of material, place measurement, from the head of section 2, at which point a shoal had formed during the progress of the contract. These operations resulted in the formation of a navigable 15-foot channel within the limits of the project, except over one small shoal area at the extreme upper end, over which navigation is comparatively limited. The minimum depth at the latter locality is slightly less than 14 feet.

The cost of operations connected with this improvement during the fiscal year 1904 has been $128,804.63. Somewhat over one-third of the total work contemplated by the project has been completed, and on June 30, 1904, the minimum depth in the channel recently dredged was 14.8 feet. The average range of tide is about 1¾ feet. The navigable depth within the limits of the channel recently dredged has been increased about 4 feet during the past year.

The available balance from the appropriations for this improvement will be applied to the payment of outstanding liabilities in connection with dredging work under the recent contract, to survey work, the repair of plant, and to general contingent operations. It is proposed to apply future appropriations to the work of deepening and widening the existing channel in the Pascagoula River, in order to secure the full dimensions called for by the existing project.

Money statement.

July 1, 1903, balance unexpended	$133,018.69
Amount appropriated by sundry civil act approved April 28, 1904	25,000.00
	158,018.69
June 30, 1904, amount expended during fiscal year, for works of improvement	128,804.63
July 1, 1904, balance unexpended	29,214.06
July 1, 1904, outstanding liabilities	11,157.00
July 1, 1904, balance available	18,057.06
Amount (estimated) required for completion of existing project	670,622.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	400,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

APPROPRIATIONS.

By act of—		By act of—	
March 2, 1827	$8,000	September 19, 1890	[a]$18,000
May 23, 1828	17,500	July 13, 1892	[a]16,200
August 30, 1852	5,000	August 18, 1894	[a]7,600
June 17, 1878	10,000	June 3, 1896	[a]1,200
March 3, 1879	14,000	March 3, 1899	[b]30,000
June 14, 1880	20,000	June 6, 1900	[b]199,600
August 5, 1886	20,000	June 13, 1902	25,000
August 5, 1886 (transferred from Horn Island Pass appropriation)	5,000	March 3, 1903	100,000
August 11, 1888	27,000	April 28, 1904	25,000
		Total	549,100

COMMERCIAL STATISTICS.

The following statement concerning the clearances from the port of Pascagoula for the calendar year ending December 31, 1903, was furnished by the United States custom-house at Pascagoula, Miss.:

Year.	Clearances.		Net tonnage.	Customs receipts.
	Foreign.	Domestic.		
1903	185	17	[a]98,476	$2,858.30

[a] In addition to the above, 64 vessels, with an aggregate net tonnage of 97,485 tons with cargoes from the port of Pascagoula, cleared from adjacent ports.

The following statement concerning the commerce of the Pascagoula River for the calendar year ending December 31, 1903, was furnished by the Pascagoula Commercial Club, of Scranton, Miss.:

Articles.	1903.	
	Tons.	Value.
ARRIVING.		
Logs and timber	420,000	$1,260,000
Fish and oysters	1,500	51,000
Total	421,500	1,311,000
DEPARTING.		
Lumber and timber	265,000	2,350,000
Rosin	11,000	165,000
Turpentine	2,000	240,000
Charcoal	9,600	57,750
Total	287,600	2,812,750

R 5.

IMPROVEMENT OF PASCAGOULA, CHICKASAHAY, AND LEAF RIVERS, MISSISSIPPI.

The river and harbor act of June 13, 1902, combined the existing projects for the improvement of Pascagoula, Chickasahay, and Leaf rivers, Mississippi, for which appropriations had formerly been made separately, into one work of improvement. From the joint appropriation of $8,500 carried by the act of 1902 for the improvement of these three streams, $4,000 was allotted to the improvement of Pascagoula River, and $2,250 each to its two tributaries, the Chickasahay and Leaf rivers.

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[a] Portions of Pascagoula River appropriations applied to dredging work.
[b] Excluding a total of $88,000 applied to dredging in Horn Island anchorage.

(A) PASCAGOULA RIVER.

This river was worked over during the fiscal year 1903, and placed in condition for rafting and light-draft navigation. No general work has been in progress during the past year, owing to lack of funds. Expenditures amounting to $577.34 have been confined to the preservation and care of public property and to the removal of an obstruction which was inaccessible during the progress of improvement in the season of 1903.

It is proposed to hold the small balance of funds still available for the work of caring for public property.

Money statement.

July 1, 1903, balance unexpended	$839.12
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	577.34
July 1, 1904, balance unexpended	261.78
July 1, 1904, outstanding liabilities	66.00
July 1, 1904, balance available	195.78
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	5,000.00

(B) CHICKASAHAY RIVER.

Snagging operations were commenced on July 1 and continued until October 19, 1903, when work was suspended owing to lack of funds. During this period the entire river within the limits of the project was worked over and placed in condition for rafting, the principal form of navigation, on a slight rise above low water.

Expenditures during the past year have amounted to $1,769.65. The balance now available will be held for the care and preservation of public property.

Money statement.

July 1, 1903, balance unexpended	$1,992.65
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1,769.65
July 1, 1904, balance unexpended	223.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	5,000.00

(c) LEAF RIVER.

An account of the work accomplished on Leaf River, with funds appropriated in 1902, is contained in the Annual Report of the Chief of Engineers for 1903, pages 1261 and 1262. Funds expended during the past year, amounting to $74.05, have been applied to the removal of a few obstructions near the mouth of the river and to the care and preservation of working plant.

Money statement.

July 1, 1903, balance unexpended	$324.35
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	74.05
July 1, 1904, balance unexpended	250.30
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	5,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

For Pascagoula River:	
By act of—	
March 3, 1881	$4,000
August 2, 1882	8,000
July 5, 1884	3,000
September 19, 1890	[a] 2,000
July 13, 1892	[a] 3,800
August 18, 1894	[a] 5,400
June 3, 1896	[a] 4,800
June 13, 1902 (allotment)	4,000
Total	35,000
For Chickasahay River:	
By act of—	
September 19, 1890	$5,000
July 13, 1892	5,000
August 18, 1894	5,000
June 3, 1896	2,000
March 3, 1899	2,500
June 13, 1902 (allotment)	2,250
Total	21,750
For Leaf River:	
By act of—	
September 19, 1890	$5,000
July 13, 1892	5,000
August 18, 1894	2,500
June 3, 1896	2,500
March 3, 1899	2,500
June 13, 1902 (allotment)	2,250
Total	19,750

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[a] Portions of Pascagoula River appropriations applied to snagging work.

COMMERCIAL STATISTICS.

The following statement concerning the commerce of the Pascagoula River and its tributaries, the Chickasahay and Leaf rivers, for the calendar year ending December 31, 1903, was furnished by the Pascagoula Commercial Club, of Scranton, Miss.:

Articles.	1903.	
	Tons.	Value.
PASCAGOULA RIVER.		
Logs, lumber, piling, etc	120,000	$360,000
Turpentine	3,000	360,000
Rosin	8,000	120,000
Charcoal	1,250	7,500
General merchandise	3,000	240,000
Total	135,250	1,087,500
CHICKASAHAY RIVER.		
Logs and timber	60,000	180,000
Turpentine	125	15,000
Rosin	500	7,500
General merchandise	250	20,000
Total	60,875	222,500
LEAF RIVER.		
Logs and timber	165,000	495,000
Turpentine	50	6,000
Rosin	200	3,000
General merchandise	50	2,500
Total	165,300	506,500

NOTE.—The tonnages of the Chickasahay and Leaf rivers passed down the Pascagoula River, but in the above statements the business originating on each stream is included alone.

R 6.

IMPROVEMENT OF HARBOR AT BILOXI, MISSISSIPPI.

An account of work performed at this locality is contained in the Annual Report of the Chief of Engineers for 1894, page 1325.

With the funds appropriated in the river and harbor act of June 13, 1902, a complete survey of Biloxi Harbor was undertaken in October, 1902. This survey showed that during the ten years which had elapsed since the last dredging, the entrance channel leading to the wharves at Biloxi had shoaled over its entire length. The work of redredging this channel was advertised under date of March 10, 1903, and a contract for the execution of the work was entered into May 21, 1903, with Mr. Rittenhouse Moore, of Mobile, Ala., at the rate of 22 cents per cubic yard, place measurement.

Operations under this contract were commenced on December 22, 1903, and were completed on January 27, 1904, one machine—a hydraulic dredge equipped with a 12-inch pump—being employed on this work.

As a result of work accomplished under this contract an uninterrupted channel with a least depth of 8 feet and a width of from 70 to 100 feet has been formed between the 8-foot curve of depth in Mississippi Sound and deep water in front of the wharves at Biloxi. The total length of the cut thus dredged was 6,498 feet, while the material excavated in accordance with the specifications amounted to 36,395 cubic yards, place measurement. This material was deposited between 1,000 and 1,500 feet westward of the channel. About one-half the work necessary to fully restore the Biloxi channel to the dimensions of the existing project has been completed under the above contract, and it is therefore proposed to apply future appropriations to the work of increasing the extent of the channel to its projected width of 150 feet.

On June 30, 1904, the minimum depth in the dredged cut was 7½ feet.

Money statement.

July 1, 1903, balance unexpended	$9,424.70
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	9,259.06
July 1, 1904, balance unexpended	165.64
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	15,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

By act of—

August 2, 1882	$5,000
August 5, 1886	12,500
August 11, 1888	18,500
September 19, 1890	9,000
June 13, 1902	10,000
Total	55,000

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1903.

Articles.	1903.	
	Tons.	Value.
IMPORTS.		
Oysters, fish, shrimp, etc	95,000	$525,543
Lumber, brick, and building material	17,000	75,640
General merchandise	25,000	478,446
Total	137,000	1,079,629
EXPORTS.		
Lumber and timber	65,000	316,247
Naval stores, charcoal, etc	10,000	335,419
Oysters, fish, shrimp, etc	3,500	156,853
General merchandise	2,500	49,288
Total	81,000	857,807

R 7.

CHANNEL FROM GULFPORT TO SHIP ISLAND HARBOR, MISSISSIPPI.

Dredging at this locality under the existing contract with Mr. Spencer S. Bullis, of Gulfport, Miss., was commenced April 16, 1901, and has been prosecuted continuously since that date. This contract calls for the completion of a channel 300 feet wide between Ship Island Harbor and Gulfport, Miss., with an anchorage basin at its shore end, 2,640 by 1,320 feet in area, both with a depth of 19 feet at low water.

The work of dredging the channel to its projected dimensions was completed in the fiscal year 1903. The contractor then commenced redredging the central portions of the channel, in order to remove some shoals and to insure a sufficient depth therein at the time of the final examination. This work was completed in July, 1903, when the last grapple dredge was removed from the work.

During the past fiscal year, operations have been directed principally toward the enlargement of the anchorage basin. A new hydraulic dredge, *No. 2*, with a 20-inch discharge, was completed and placed on this work in the latter part of August, 1903. Since the latter date, this machine has been employed on dredging work in the anchorage area. Hydraulic dredge *Cape Charles* was engaged in the anchorage basin from July 1, to November 30, 1903. This machine was then transferred to the channel, and has been subsequently engaged in removing shoals from the dredged cut, except for a period of about three months, during which time repair work was in progress.

On June 30, 1904, the depths in the dredged channel varied from 18 feet to 28 feet, while about three-quarters of the area of the anchorage basin had been dredged to the specified depth.

It is proposed to hold available funds for contract payments until the completion of the channel and basin to their projected dimensions. The funds appropriated in the sundry civil act of April 28, 1904, for maintenance will be held until the channel and basin have been properly maintained for the period of one year after acceptance by the United States.

Statement of expenditures for examinations and inspections of work of dredging a channel and anchorage basin between Ship Island Harbor and Gulfport, Miss., during the fiscal year ending June 30, 1904, submitted in accordance with Circular No. 12, Office of the Chief of Engineers, dated July 31, 1897.

Items.	Allotted.	Expended.	Balance.
Inspection and superintendence	$2,860.00	$53.94	$2,806.06
Examinations and surveys	5,000.00	211.32	4,788.68
Office expenses	1,000.00	58.34	941.66
Mileage	150.00	35.84	114.16
Incidentals	390.00	27.36	362.64
Outstanding liabilities	300.77	300.77	....
Total	9,700.77	687.57	9,013.20

Money statement.

July 1, 1903, balance unexpended	$155,903.77
Amount appropriated by sundry civil act approved April 28, 1904	10,000.00
June 30, 1904, amount allotted during fiscal year	3,797.00
	169,700.77
June 30, 1904, amount expended during fiscal year	687.57
July 1, 1904, balance unexpended	169,013.20
July 1, 1904, amount covered by uncompleted contracts	160,000.00

APPROPRIATIONS.

By act of—

July 5, 1884 (allotments)	$20,482.04
June 28, 1902	150,000.00
April 28, 1904 (maintenance)	10,000.00
Total	180,482.04

CONTRACT IN FORCE.

With Spencer S. Bullis, dated February 20, 1901, approved by the Chief of Engineers, March 18, 1901, for dredging a channel and anchorage basin in Mississippi Sound between Ship Island Harbor and Gulfport, Miss., for $150,000, and for maintaining said channel and anchorage basin for a period of five years after its completion for the sum of $10,000 annually. Work commenced April 16, 1901; was to be completed by April 16, 1903. Time of completion has been extended for such period as is deemed reasonable by the district engineer officer. Maintenance to commence immediately upon completion of the channel and basin.

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1903.

	No. of vessels.	Net registered tonnage.	Timber exported.	Estimated value.
			Tons.	
Year 1903	111	119,878	176,000	$1,665,000

Clearances.

	Steamships.	Ships.	Barks.	Schooners.	Total.	Tonnage.
Year ending Dec. 31, 1903	46	8	23	34	111	119,878

R 8.

IMPROVEMENT OF PEARL RIVER BELOW ROCKPORT, MISSISSIPPI.

During the past fiscal year available funds have been applied to snagging work. The snag boat *Pearl*, which was placed in commission June 1, 1903, was engaged on work in connection with this improvement until November 23, 1903, when operations were suspended owing to the lack of funds. Between July 1 and the date of completion, a distance of about 31 miles of river was worked over and placed in a safe condition for light-draft navigation and rafting on a slight rise above low water. The channel at Peters Cut-off, 100 miles above the mouth of the stream, was also cleared of obstructions.

The work accomplished during the year necessitated the expenditure of $3,285.20 and resulted in placing the lower 100 miles of the Pearl River in a fair condition for navigation.

The small balance now available will be held for the care of public property.

It is proposed to apply future appropriations to the work of extending or maintaining this improvement, as may be directed, the project not yet having been completed.

Money statement.

July 1, 1903, balance unexpended		$3,511.18
Amount allotted from appropriation for maintenance of river and harbor improvement, act June 13, 1902		2,000.00
		5,511.18
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		3,285.20
July 1, 1904, balance unexpended		2,225.98
Amount (estimated) required for completion of existing project		33,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$10,000.00	
For maintenance of improvement	7,000.00	
		17,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

By act of—		By act of—	
June 14, 1880	$30,000	August 18, 1894	$5,000
March 3, 1881	25,000	June 3, 1896	10,000
August 2, 1882	15,000	March 3, 1899	7,000
July 5, 1884	10,000	June 13, 1902	7,000
August 5, 1886	13,125	June 13, 1902 (allotment)	2,000
August 11, 1888	10,000		
September 19, 1890	15,000	Total	164,125
July 13, 1892	15,000		

COMMERCIAL STATISTICS FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1903.

Articles.	Tons.	Value.
Pine and cypress logs	200,000	$450,000
Cotton, naval stores, etc	2,500	150,000
Total	202,500	600,000

In addition to the above, manufactured lumber to the value of about $600,000 passes over the portions of the stream not included in the present project of improvement.

R 9.

IMPROVEMENT OF PEARL RIVER BETWEEN EDINBURG AND JACKSON, MISSISSIPPI.

The river and harbor act of June 13, 1902, made a single appropriation for the two upper sections of the Pearl River, one from Carthage to Jackson and the other from Edinburg to Carthage, thus combining into one work the projects for the improvement of these two sections of this stream.

The existing project for this improvement contemplates the maintenance of the improved channel between Edinburg and Jackson obtained under earlier appropriations. In conformity with this project, snagging operations which were in progress between September 9 and December 31, 1902, were resumed on July 17, 1903, at a point 68 miles below Edinburg. Work was continued until September 10, 1903, when operations were suspended, owing to the fact that available funds had become exhausted. During this period of about two months the worst obstructions in the lower half of the extent of the project were removed, and the working party was disbanded at Jackson, Miss., the lower limit of this improvement. The amount expended on snagging work during the year is $787.41. It is proposed to apply the small available balance to the preservation of public property, and to apply future appropriations to the work of maintaining the channel of Pearl River within the limits of this project.

No commercial statistics relating to this improvement could be obtained.

Money statement.

July 1, 1903, balance unexpended	$1,049.29
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	787.41
July 1, 1904, balance unexpended	261.88
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	7,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Carthage to Jackson.

By act of—	
March 3, 1879	$6,000
June 14, 1880	7,500
March 3, 1881	2,500
August 2, 1882	2,500
August 6, 1886	2,250
August 11, 1888	2,500
September 19, 1890	3,000
By act of—	
July 13, 1892	$5,000
August 18, 1894	2,400
June 3, 1896	2,400
March 3, 1899	2,500
June 13, 1902	[a] 3,000
Total	41,550

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[a] For expenditure between Edinburg and Jackson.

Edinburg to Carthage.

By act of—	
July 5, 1884	$2,500
August 5, 1886	2,250
August 11, 1888	5,000
September 19, 1890	5,000
July 13, 1892 (maintenance)	500
August 18, 1894 (maintenance)	$500
June 3, 1896 (maintenance)	500
March 3, 1899 (maintenance)	1,000
Total	17,250

R 10.

REMOVING SUNKEN VESSELS OR CRAFT OBSTRUCTING OR ENDANGERING NAVIGATION.

On November 10, 1903, the hydraulic dredge *Jumbo*, which was employed under the contract for the formation of a channel in the Gulf of Mexico through the outer bar of Mobile Harbor, Alabama, sank at this locality while at work. The owner of the dredge attempted to move the wreck into Mobile Bay, in order to undertake the work of raising it in calm water. This operation was unsuccessful, however, and the machine was abandoned at the southern end of the proposed channel, near the light-house range, in a position where the wreck was deemed a menace to navigation. In order to effect the removal of the wreck an allotment of $2,000 from the indefinite appropriation for "Removing sunken vessels or craft obstructing or endangering navigation" was made under date of December 16, 1903.

The work of removing the *Jumbo* was commenced on December 26, 1903. Efforts were at first made to tow the wreck to some point where it would be out of the way of navigation, but owing to the fact that the stern of the dredge had become firmly embedded in the bottom of the Gulf of Mexico, this attempt proved unsuccessful. The hull of the machine was therefore cut in two by dynamite at the point where it emerged from the bottom, the forward portion was beached and the projecting portions of the stern were leveled down so as to offer no obstruction to navigation. This work was performed by United States plant and hired labor, and was completed on January 15, 1904, at a total cost of $1,526.39. The balance of the allotment, amounting to $473.61, was redeposited to the credit of the indefinite wreck appropriation on February 29, 1904.

On March 3, 1904, the Russian bark *Hilja* was reported on fire in Horn Island Harbor, Mississippi, and in danger of sinking in the anchorage area. A tugboat was immediately hired and the burning vessel was beached on the north shore of Horn Island at a point where it could not endanger navigation. Under date of March 15, 1904, an allotment of $350 was made from the indefinite wreck appropriation for the purpose of defraying the cost of moving the wreck and for the work of removing the vessel's iron masts and yards, which had fallen overboard in deep water and which proved a menace to navigation. The owners of the latter wreckage were in the meantime ordered to remove it without cost to the United States and are engaged on this work at the present time.

The total expenditure on operations connected with the wreck of the *Hilja* up to June 30, 1904, amounted to $30.23. The balance of the allotment will be held pending the outcome of the owners' attempt to remove the existing wreckage.

R II.

SURVEY OF BLACK WARRIOR AND TOMBIGBEE RIVERS, ALABAMA.

(A) SURVEY OF BLACK WARRIOR RIVER, ALABAMA, WITH A VIEW TO DETERMINE THE LOCATION OF LOCKS NOS. 5 AND 6 (NOW 14 AND 15).

ENGINEER OFFICE, UNITED STATES ARMY,
Mobile, Ala., November 13, 1903.

GENERAL: In compliance with provision in the river and harbor act approved June 13, 1902, I have the honor to report the completion of the survey to determine the location of Locks 5 and 6 in the Black Warrior River, Alabama.

Under authority of the Chief of Engineers the numbering of these locks has been changed so as to make a complete series from Mobile to the head of the Black Warrior River. Under this system of numbering the two locks referred to will be Nos. 14 and 15, Black Warrior River, Alabama, and it is desirable that they should be so designated in any future appropriation acts.

The lift of each lock in the project has been fixed at 14 feet, and as there seems no reason now apparent for making any change in this dimension, the estimate has been made accordingly. The location determined on for Lock 14 is at Arnold's shoals, about 374 miles above Mobile, and the location for Lock 15 is at Rose shoals, about 380 miles above Mobile. They are 13 and 19 miles, respectively, above Tuscaloosa. The length of Dam 14 will be about 930 feet and that of Dam 15 about 875 feet. The foundations for both locks and dams will be on the hard sandstone found near the surface; and it is proposed to build the lock walls and dams and abutments of concrete. The sites of the two locks were connected by levels with previously completed work on the river below, and at each place selected borings, cross sections, and an otherwise complete topographical survey was made. In each case borings were carried 5 feet or more into the rock underlying the site, in order to determine the character and suitability of this rock for foundation purposes. The sites determined upon are favorable, inasmuch as the foundations are good and the unusual width of the river makes it possible to provide for longer dams than have been heretofore built in the lower part of the river. The increased length of dams will, however, somewhat increase the cost. The quantities of the different kinds of work are deduced from caculations based on the survey. The prices assumed are deduced from previous contract prices for similar work on the river. They are somewhat larger than those of previous contracts, but, on account of the uncertainty in regard to floods and other local conditions on this river, including the isolated location of the lock sites, I believe it to be only prudent to make them so.

The following is an estimate of the quantities and cost of Locks and Dams Nos. 14 and 15:

Lock and Dam No. 14.

3 acres grubbing and clearing, at $50	$150
35,000 cubic yards earth excavation, at 40 cents	14,000
26,000 cubic yards earth embankment, at 40 cents	10,400
3,600 cubic yards rock excavation, at $4	14,400

29,000 cubic yards concrete, at $7	$203,000
800 cubic yards concrete paving, at $7.50	6,000
4,500 cubic yards stone filling, at $1.50	6,750
7,000 cubic yards riprap, hand placed, at $2	14,000
200 cubic yards puddling, at $2	400
4,400 feet B. M. miter sills, at $75 per M	330
140,000 feet B. M. framed heart timber, at $35 per M	4,900
94,000 feet B. M. framed timber, at $30 per M	2,820
464,000 feet B. M. cofferdam timber, at $30 per M	13,920
20,000 feet B. M. sheathing, at $25 per M	500
500 linear feet drainpipe, at 30 cents	150
Purchase of sites	3,000
Buildings	8,000
Gates, valves, and special irons	20,000
4 miles of telephone line, at $250	1,000
Engineering and contingencies	26,280
Total for Lock and Dam No. 14	350,000

Lock and Dam No. 15.

5 acres grubbing and clearing, at $50	$250
20,000 cubic yards earth excavation, at 40 cents	8,000
26,000 cubic yards earth embankment, at 40 cents	10,400
2,500 cubic yards rock excavation, at $4	10,000
31,000 cubic yards concrete, at $7	217,000
800 cubic yards concrete paving, at $7.50	6,000
4,800 cubic yards stone filling, at $1.50	7,200
5,500 cubic yards riprap, hand placed, at $2	11,000
200 cubic yards puddling, at $2	400
4,400 feet B. M. miter sills, at $75 per M	330
140,000 feet B. M. framed heart timber, at $35 per M	4,900
109,000 feet B. M. framed timber, at $30 per M	3,270
438,000 feet B. M. cofferdam timber, at $30 per M	13,140
20,000 feet B. M. sheathing, at $25 per M	500
500 linear feet drainpipe, at 30 cents	150
Purchase of sites	3,000
Gates, valves, and special irons	20,000
Buildings	8,000
6 miles of telephone line, at $250	1,500
Engineering and contingencies	34,960
Total for Lock and Dam No. 15	360,000

Recapitulation.

Lock and Dam No. 14	$350,000
Lock and Dam No. 15	360,000
Total	710,000

Maps of this survey are being prepared and will be forwarded as soon as completed.

Respectfully submitted.

W. E. Craighill,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer,
Gulf Division,
New Orleans, La., November 17, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army. No opinion as to the locations for Locks 5 and 6 (14 and 15), Black

Warrior River, selected by Captain Craighill, is expressed pending the receipt of the maps of the survey mentioned in paragraph 5 of the report.

Assuming the quantities given to be correct, the estimate submitted by Captain Craighill appears to be reasonable.

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, January 30, 1904.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Mackenzie:

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., February 23, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

Having reviewed the within and the accompanying reports of the district officer on matters relative to the improvement of Black Warrior, Warrior, and Tombigbee rivers, the Board of Engineers for Rivers and Harbors respectfully invites attention to its report herewith.

For the Board:

A. M. MILLER,
Lieut. Col., Corps of Engineers,
Senior Member of Board.

(B) SURVEY OF TOMBIGBEE RIVER, ALABAMA, WITH A VIEW TO DETERMINE THE NECESSARY LOCK SITES BETWEEN DEMOPOLIS AND McGREWS SHOALS.

ENGINEER OFFICE, UNITED STATES ARMY,
Mobile, Ala., December 28, 1903.

GENERAL: In compliance with provision in the river and harbor act approved June 13, 1902, a survey has been made during the past two seasons to determine the location and cost of Locks 2 and 3 and the cost of completing Lock 1 in the Tombigbee River, Alabama, and I have the honor to submit the following report of this survey:

The total lift of the three locks is to be 31 feet, and is intended to render available for navigation all the year round a channel with a least depth of 6 feet from Demopolis, Ala., to the mouth of the Tombigbee River, a distance of about 185 miles.

Lock 1 is located at McGrews shoals, Alabama, 111 miles above Mobile, Ala., and 119 miles below Demopolis, Ala. The walls of this lock have been erected, part of the filling placed behind the bank wall, and the gates partially constructed. The estimate herein submitted for the completion of this lock is based on the building of a concrete dam and apron 500 feet long, with 11 feet lift, by cofferdamming; abutment approaches to be excavated and riprapped 50 feet above and 100 feet below the abutment; three guard cribs to be erected above the lock.

It is proposed to locate Lock 2 at Tickabum shoals, 181 miles above Mobile and 49 miles below Demopolis, and to locate Lock 3 at Griffin's bar, 205 miles above Mobile and 25 miles below Demopolis. However, future developments may show a change in the locations of these two locks to be desirable in order to place them at sites where the hardpan approaches near the low-water surface of the river and thus dispense with the pile foundations.

The estimates for Locks 2 and 3 contemplate the foundation of locks and abutments on hardpan; crib dams 50 feet wide and 500 feet long, each with 10-foot lift, carried down either to hardpan or to 10 feet below low water, to be built without cofferdamming; abutment approaches to be excavated and riprapped 50 feet above and 100 feet below abutments; lock floors to be of concrete 1½ feet thick; three guard cribs above each lock; bank slopes to be riprapped 100 feet above and 300 feet below the locks.

Below are submitted estimates in detail for the three locks. The quantities of the different items of work are secured from calculations based on the survey. The prices are somewhat higher than previous prices for similar work in this district, owing to the isolated locations of the lock sites and the very unfavorable climatic conditions attending them. The estimate includes all the necessary buildings and a telephone line from Demopolis to the lowest lock. The latter is a necessary part of the equipment, both during construction and maintenance, and no commercial line is available.

Lock and Dam No. 1.

6 acres grubbing and clearing, at $100	$600
66,000 cubic yards earth excavation, at 45 cents	29,700
1,600 cubic yards rock excavation, at $4	6,400
9,000 cubic yards concrete, at $8	72,000
800 cubic yards concrete paving, at $9	7,200
1,300 cubic yards gravel filling, at $2.25	2,925
2,200 cubic yards stone filling, at $4	8,800
1,500 cubic yards riprap, at $4.50	6,750
100 cubic yards puddling, at $3	300
61,000 feet B. M. framed heart timber, at $50 per M	3,050
30,000 feet B. M framed timber, at $45 per M	1,350
200,000 feet B. M. cofferdam timber, at $45 per M	9,000
30,000 feet B. M. sheathing, at $35 per M	1,050
100 linear feet drainpipe, at 40 cents	40
Purchase of sites	5,000
Buildings	8,000
Gates, valves, and special irons	10,000
32 miles telephone line, at $250 per mile	8,000
Engineering and contingencies	19,835
Total	200,000

Lock and Dam No. 2.

12 acres grubbing and clearing, at $100	$1,200
191,000 cubic yards earth excavation, at 45 cents	85,950
1,600 cubic yards rock excavation, at $4	6,400
21,000 cubic yards concrete, at $8	168,000
850 cubic yards concrete paving, at $9	7,650
1,800 cubic yards gravel filling, at $2.25	4,050
17,000 cubic yards stone filling, at $4	68,000
3,100 cubic yards riprap, at $4.50	13,950
200 cubic yards puddling, at $3	600
4,400 feet B. M. miter sills, at $100 per M	440
539,000 feet B. M. framed heart timber, at $50 per M	26,950
424,000 feet B. M. framed timber, at $45 per M	19,080
275,000 feet B. M. cofferdam timber, at $45 per M	12,375
100,000 feet B. M. sheathing, at $35 per M	3,500
500 linear feet drainpipe, at 40 cents per linear foot	200
Purchase of sites	3,000
Buildings	10,000
Gates, valves, and special irons	20,000
32 miles telephone line, at $250 per mile	8,000
Engineering and contingencies	57,655
Total	517,000

Lock and Dam No. 3.

20 acres grubbing and clearing, at $100	$2,000
130,000 cubic yards earth excavation, at 45 cents	58,500
1,600 cubic yards rock excavation, at $4	6,400
23,000 cubic yards concrete, at $8	184,000
450 cubic yards concrete paving, at $9	4,050
1,500 cubic yards gravel filling, at $2.25	3,375
14,200 cubic yards stone filling, at $4	56,800
2,100 cubic yards riprap, at $4.50	9,450
200 cubic yards puddling, at $3	600
4,400 feet B. M. miter sills, at $100 per M	440
539,000 feet B. M. framed heart timber, at $50 per M	26,950
373,000 feet B. M. framed timber, at $45 per M	16,785
275,000 feet B. M. cofferdam timber, at $45 per M	12,375
100,000 feet B. M. sheathing, at $35 per M	3,500
500 linear feet drainpipe, at 40 cents	200
Purchase of sites	3,000
Buildings	10,000
Gates, valves, and special irons	20,000
32 miles telephone line, at $250 per mile	8,000
Engineering and contingencies	56,575
Total	483,000

Recapitulation.

Lock and Dam No. 1	$200,000
Lock and Dam No. 2	517,000
Lock and Dam No. 3	483,000
Total	1,200,000

Respectfully submitted.

W. E. CRAIGHILL,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., December 30, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army.

By the act approved June 13, 1902, page 27, paragraph 3, the Secretary of War is authorized and directed to cause a survey to be made to determine the location of the necessary lock sites on the Tombigbee River between Demopolis and McGrews shoals.

In the absence of maps showing results of the surveys, no opinion as to the tentative locations selected for Locks 2 and 3 is expressed.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

The Board of Engineers for Rivers and Harbors,
Washington, D. C., February 23, 1904.

General: The Board of Engineers for Rivers and Harbors, in compliance with first indorsement, War Department, Office of the Chief of Engineers, has the honor to submit the following report relative to the improvement of the Black Warrior, Warrior, and Tombigbee rivers, Alabama:

In section 1 of the river and harbor act of June 13, 1902, the Secretary of War was authorized and directed to cause a survey to be made "to determine the location of the necessary lock sites in Tombigbee River between Demopolis and McGrews shoals and of Locks 5 and 6 in the Black Warrior." The district officer's reports upon this survey have been examined by the Board. In addition to these reports the district officer submits an estimate of additional funds needed for the completion of Locks 1, 2, and 3, Warrior River, and a report upon and estimate for certain work not heretofore provided for, which is essential to a satisfactory completion of the project. In addition to the consideration given to the several reports enumerated above, the Board has reviewed the history of the improvement of these rivers from its inception to the present time. A convenient index map for the study of the situation is found in the Annual Report of the Chief of Engineers for 1902, opposite page 1304.

The Black Warrior, Warrior, and Tombigbee rivers, together with the Mobile River, connect the Warrior coal fields with the Gulf of Mexico. The Black Warrior is formed by the junction of Mulberry and Locust forks. At Tuscaloosa the name changes to Warrior. The Warrior flows into the Tombigbee about 1 mile above Demopolis, and the Tombigbee and Alabama rivers form the Mobile River about 45 miles above the city of Mobile. The total length of these rivers from Mulberry and Locust forks to Mobile is 408 miles and the total fall at low water is 214½ feet. The Mobile River is of ample depth and requires no improvement. Previous to improvement the Tombigbee River was navigable for light-draft vessels to Demopolis for about nine months annually and the Warrior to Tuscaloosa about four months annually. Tuscaloosa was considered the head of navigation. Rafts and flatboats were brought down the Black Warrior on floods, but there was no other navigation on this stream.

The improvement of the Tombigbee began in 1872, under a project for the removal of snags, logs, and other obstructions, with a view to obtaining a channel of from 3 to 4 feet available depth. Work was carried on under this and modified projects, which included dredging through shoals and building dikes and training walls, for a number of years. During the progress of the work it became apparent that this method of improvement was inadequate, as a greater depth was demanded for the transportation of coal from the Warrior fields to the sea.

In 1884 a 6-foot slack-water project was inaugurated for the Black Warrior in the vicinity of Tuscaloosa. The slack-water project has been gradually extended and now, as defined by the river and harbor act of June 13, 1902, it embraces the Tombigbee River from its mouth to Demopolis, the Warrior from Demopolis to Tuscaloosa, and the Black Warrior from Tuscaloosa to Mulberry and Locust forks.

Upon the Tombigbee River three locks in all will be required. Lock 1 has been partially constructed, at a cost of about $200,000, and the district officer reports that to complete Lock 1 and to construct Locks 2 and 3, completing the improvement of the Tombigbee section, will require the further expenditure of $1,200,000. The Board has reviewed this estimate and believes that it is ample to cover all contingencies.

Upon the Warrior 6 locks in all will be required. Nos. 4, 5, and 6 have been completed, at a cost of about $628,000. Nos. 1, 2, and 3 have been placed under the continuous-contract system and are under construction. A limit of cost of $874,000 was fixed by Congress, in the act of June 13, 1902, but under authority of the same act $21,000 has been diverted for snagging and surveys, leaving but $853,000 expended, available, or to be appropriated in sundry civil acts for the construction of Nos. 1, 2, and 3. Due principally to changes in the foundations, made necessary by unexpectedly unfavorable physical conditions, this amount will not suffice for completion. The district officer estimates that $94,466 in addition will be required, and the Board concurs as to this necessity.

Upon the Black Warrior 11 locks in all will be required. Of these, Nos. 1, 2, 3, and 4 have been practically completed, at a cost of about $784,000. The district officer estimates that $710,000 will be required for the construction of Nos. 5 and 6, and the Board is of opinion that his estimates are ample. No recent estimates of cost, based on careful surveys, have been made in the case of Locks 7, 8, 9, 10, and 11, but tentatively the Board places their cost at $1,500,000.

In one of the communications from the district officer placed before the Board by the Chief of Engineers, an estimate of $150,000 is submitted for the purchase of a dredge and its operation in certain of the pools; for necessary guard cribs at Lock No. 4, Black Warrior River; for certain additional land and buildings; and for the surveys and purchase of sites for Locks 7, 8, 9, 10, and 11, Black Warrior River. It is the opinion of the Board that each item of work mentioned in this paragraph is a necessary corollary of the work already done.

To summarize, there has been appropriated or authorized for the slackwatering of the 408 miles of waterway between the Warrior River coal field and the port of Mobile, following the Black Warrior, Warrior, Tombigbee, and Mobile rivers, approximately $2,500,000. Of the 20 locks required in all, 10 have been built or are under contract, 1 is partially constructed, and 9 others will be needed. To complete 3 of the locks now under contract, $94,466 is required beyond amounts already appropriated or authorized; $150,000 is required for certain auxiliary work, including surveys. To complete 5 additional locks, including the one partially constructed in the Tombigbee River, will require $1,910,000. And finally, a tentative estimate of cost of the 5 locks that would still remain is $1,500,000.

The Board is of opinion that to render effective the project for the Warrior River system it should embrace all the items of work above summarized, to wit:

(*a*) Completing locks in Tombigbee River	$1,200,000
(*b*) Completing Locks 5 and 6, Black Warrior River	710,000
(*c*) Completing Locks 1, 2, and 3, Warrior River, in addition to amounts appropriated or authorized	94,466
(*d*) For a dredge, and for certain auxiliary work, including surveys	150,000
(*e*) Tentative estimate for 5 additional locks needed to complete	1,500,000
Total	3,654,466

The item preceding the last includes the cost of the surveys necessary to make a final estimate of cost of the last item.

It is the opinion of the Board that items (*c*) and (*d*) should be provided for in the next appropriation carried by a river and harbor act for the continuation of this improvement.

Respectfully submitted.

A. M. MILLER,
Lieut. Col., Corps of Engineers.
R. L. HOXIE,
Major, Corps of Engineers.
H. C. NEWCOMER,
Captain, Corps of Engineers.
W. V. JUDSON,
Captain, Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

R 12.

PRELIMINARY EXAMINATION OF CHANNEL FROM BILOXI TO SHIP ISLAND HARBOR, MISSISSIPPI.

[Printed in House Doc. No. 198, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 2, 1903.

SIR: I have the honor to submit herewith a report, dated March 6, 1903, by Capt. Spencer Cosby, Corps of Engineers, on preliminary examination of channel from Biloxi to Ship Island Harbor, Mississippi, with a view to obtaining additional depth and width. This examination was made pursuant to a requirement in the river and harbor act approved June 13, 1902, and Captain Cosby is of opinion, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, that the improvement of this locality is not worthy to be undertaken by the General Government.

This report has been reviewed by the Board of Engineers for Rivers and Harbors, under the provisions of sections 3 and 14 of the abovementioned act, and I concur in the opinion of the Board, as expressed in its report of April 21, 1903, that it is not desirable for the United States to undertake this improvement.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. SPENCER COSBY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., March 6, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of the channel from Biloxi to Ship Island Harbor, with a view to obtaining additional depth and width, made in accordance with a provision contained in the river and harbor act of June 13, 1902. The actual examination of the locality was made, under instructions from me, by Asst. Engineer David G. Anderson. A copy of his detailed report is inclosed herewith. This shows fully the existing conditions at and about Biloxi and Ship Island Harbor.

Along the 70 miles of coast line of the State of Mississippi there are no natural deep-water harbors, but the United States has formed, by dredging, artificial harbors at the three towns of Scranton, Biloxi, and Gulfport, and is still carrying on work at all three places. At Scranton, a town of about 5,000 inhabitants, situated at the mouth of the Pascagoula River, 20 miles east of Biloxi, a channel 12 feet deep has already been dredged, and an appropriation of $150,000, authorized at the last session of Congress, is now available for commencing work on the project of increasing the depth to 17 feet. The total estimated cost of completing this approved project is $1,050,222. At Gulfport, a town of perhaps 2,000 inhabitants, 12 miles west of Biloxi, a channel and anchorage basin to have a depth of 19 feet at mean low water are now being dredged under contract. For this work when completed the Government is to pay $150,000, and in addition $10,000 annually for its maintenance for five years.

The United States is thus at the present time spending large sums of money in order to provide a harbor with an available depth of 19 feet 12 miles on one side of Biloxi, while 20 miles on the other side it is creating a harbor with a depth of 17 feet. The anchorage basin at Gulfport is connected by a straight channel, having at the present time a depth of over 19 feet, with Ship Island Harbor.

The railroad along the coast from Mobile to New Orleans connects the three Mississippi towns referred to, and is the only line running to Biloxi. It is highly improbable that any large amount of freight will ever be carried over this road to Biloxi for shipment by sea. The benefits to be derived from any improvement of the channel from Biloxi to Ship Island Harbor will be purely local.

Any deepening of the channel beyond that contemplated in the existing project would probably be followed by more rapid shoaling and involve increased cost of maintenance. The commerce of Biloxi is carried on by means of small schooners and tugs, and the channel, when deepened with funds now available, will, it is believed, fully serve the legitimate needs of these boats.

In view of all these facts, and of the large sums of money now being spent by the Government for the improvement of the harbors on the coast of Mississippi in the immediate vicinity of Biloxi, the deepening and widening of the channel from Biloxi to Ship Island Harbor is not believed to be an improvement worthy to be undertaken by the General Government.

Respectfully submitted.

Spencer Cosby,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., March 9, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army.

The act approved June 13, 1902, requires a preliminary examination of "channel from Biloxi to Ship Island Harbor, with a view to obtaining additional depth and width."

The present project, approved August 14, 1902, provides for the expenditure of the appropriation of $10,000 made by the river and harbor act of June 13, 1902, in securing, by dredging, a channel 8 feet deep at mean low water and 150 feet wide from Mississippi Sound to the wharves at Biloxi.

I do not consider the locality to be worthy of improvement by the General Government to a greater extent than provided for by the present project.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
March 16, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

Additional information has been called for, if available.

A. Mackenzie,
Acting Chief of Engineers.

[Third indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., April 21, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on the preliminary examination of "channel from Biloxi to Ship Island Harbor [Mississippi], with a view to obtaining additional depth and width," the indorsement of the division engineer thereon, and other data available.

At the mouth of the Pascagoula River, 20 miles east of Biloxi, a 12-foot channel to Mississippi Sound has been excavated by the United States. The deepening of this channel to 17 feet has already been approved by Congress, and an appropriation is available for prosecuting the work. From Gulfport, Miss., 12 miles west of Biloxi, with funds appropriated by Congress, a 19-foot channel is being excavated to Ship Island Harbor.

There was completed by the United States in 1892 a channel 6,000 feet long, 160 feet wide, and 9 feet deep from the wharves at Biloxi to Mississippi Sound. Due to natural agencies this channel has shoaled from 1 to 2 feet throughout its length, but the sum of $10,000, appropriated by act of June 13, 1902, is available for purposes of restoration, and the expenditure of this sum will probably result in a channel 150 feet wide and 8 feet deep.

Biloxi is the terminus of no rail or interior water route. The needs of general commerce are sufficiently provided for at neighboring harbors. Even if there were a dredged channel 13 feet deep, as is desired by local interests, it is believed that the commerce resulting would be too small in amount to warrant the necessary expenditure.

For the reasons given above it is the opinion of the Board that it is not desirable for the United States to extend the scope of the present project for a "channel from Biloxi to Ship Island Harbor," Mississippi.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

MOBILE, ALA., *February 26, 1903.*

CAPTAIN: I have the honor to submit the following report upon the preliminary examination of the channel from Biloxi to Ship Island Harbor, Mississippi, made in accordance with a provision contained in the river and harbor act of June 13, 1902. This examination was undertaken in compliance with your instructions, and the information contained in this report was secured in October, 1902, and January and February, 1903.

Geographical location.—The State of Mississippi, along a portion of its southern boundary, borders the Gulf of Mexico for a distance of about 70 miles. Several towns are situated along this portion of the coast, the largest of which, Biloxi, is located about 80 miles east of New Orleans, La., and about 60 miles west of Mobile, Ala. This town is located on the extreme eastern end of a point of land about 10 miles long and 1½ miles wide, which extends between Mississippi Sound and the Back Bay of Biloxi. On its south side Biloxi has a water frontage on Mississippi Sound, while on the east and north it borders the Back Bay, the latter waterway being an estuary of Mississippi Sound. Mississippi Sound is the name given to the body of water intervening between the mainland of the Mississippi and Alabama coast and the fringe of islands parallel thereto, and from 6 to 10 miles to the southward.

No natural deep-water harbors exist along the Mississippi coast, but owing to the fact that the islands parallel to the coast act as natural breakwaters, the deep-water pockets on the north side of one or two of these islands are used for harbor purposes. The most important of these anchorages is Ship Island Harbor, which is on the north side of Ship Island, and which can be utilized by vessels loading to a draft of about 24 or 25 feet. Ship Island Pass, the entrance to this harbor from the Gulf of Mexico, is about 13 miles southeast of Gulfport, Miss., while the eastern limit of Ship Island anchorage is about 10 miles south of Biloxi.

Physical characteristics.—Except for the areas immediately north of several of the islands referred to, and the channels through one or two of the passes between these islands, the depths of water in Mississippi Sound are comparatively shallow. The slope southward from the mainland is very flat, the usual distance from the shore line to the 12-foot curve of depth being from 4 to 5 miles.

The bottom of the sound is generally sand near the shore line, clay somewhat farther out, and soft mud for the balance, and by far the greater part of the distance, to deep water. The material composing the bottom is of such a character as to be readily handled by a dredge. No natural channels of any depth exist through this northern, or mainland, slope of the sound, and the channels which have been obtained into Pascagoula River, Biloxi, and Gulfport are the result of dredging.

Biloxi is situated at the northernmost point in the concavity formed by the coast line in its sweep between Belle Fontaine Point and Bay St. Louis. In this concavity, and in the vicinity of Biloxi, are also located the Back Bay of Biloxi and Deer Island, the latter being almost immediately opposite the mouth of the Back Bay. The Back Bay of Biloxi has an area of about 12 square miles, and drains a watershed slightly less than 700 square miles in extent, principally through Big Biloxi River, a stream about 35 miles long.

Deer Island runs northwest and southeast, and is a narrow strip of sand about 5 miles long. The western end of the island, which is in front of the city of Biloxi, is about one-half mile from the shore, while its eastern end is about 1½ miles from the mainland. This island, with the bar extending to the westward, shelters the greater part of the water front of Biloxi along Mississippi Sound, and in conjunction with the Back Bay affords an ample extent of well-protected anchorage area. Deer Island also causes a division of the currents flowing in and out of the Back Bay, a part of these currents passing around the western end of the island and along the water front of Biloxi, and the remainder passing around its eastern end. As might be expected, there are three shoals resulting from this flow of the currents:

First. A shoal just north of Deer Island where the ebb current separates and flood currents meet. The low-water depths on this shoal are about 4 or 5 feet.

Second. A shoal at the eastern end of Deer Island beyond the point where the contraction of the current due to the island ceases. The least depth on this shoal is about 7½ feet at mean low water.

Third. A similar shoal at the western end of Deer Island. The least depth on this shoal before its improvement was about 4½ feet at mean low water.

Between the anchorage in the Back Bay and deep water in Mississippi Sound, two shoals therefore intervene, no matter which route is followed, while between the southern water front of Biloxi and Mississippi Sound at least one shoal has to be crossed. The waterway between the southern water front of Biloxi and the bar extending westward from Deer Island has available depths of from 12 to 15 feet. Beyond the latter sand spit, however, the channel shoals up rapidly, the original depth over the shoal at this locality, as above stated, being about 4½ feet. The existing depths in the dredged channel through this bar, referred to the present plane of mean low water, range from 6 to 8 feet. The low-water plane at this locality has, however, recently been lowered about one-half foot, in order to conform with the results of the Mississippi River Commission's tidal observations in the Back Bay.

The outer end of the dredged cut leading into Biloxi Harbor is marked by a light-house beacon, designated "A," which is about 7,000 feet offshore. To the south of this beacon no dredging has been performed, and the existing depths are the natural depths on the northern slope of Mississippi Sound. A line of time soundings was run south of this beacon along the prolongation of the dredged cut, and the following results were obtained as to the degree of slope at this locality:

Curve of depth (low water).	Distance south of light-house beacon "A."	Distance between adjacent contours.
Feet.	*Feet.*	*Feet.*
8	0	....
9	1,907	1,907
10	3,687	1,780
11	6,357	2,670
12	14,494	8,137
13	17,800	3,306
14	20,597	2,797
15	24,666	4,069

From the above table it is apparent that the slope of the bottom, within the limits under consideration, is steepest between the 8 and 11 foot contours, very flat between the 11 and 12 foot contours, with an intermediate slope between 12 and 15 feet.

The currents in and out of Biloxi Harbor are comparatively feeble, the maximum current apparently occurring between Deer Island and Biloxi on an ebb tide with an easterly wind. Beyond the western end of the island, however, the strength of this current is quickly dissipated. In the sound proper the normal currents are also feeble, but are influenced to a great extent by the direction and force of the wind. The maintenance of a dredged cut is therefore uncertain.

Previous improvements.—The river and harbor act of March 3, 1881, made a provision for a preliminary examination and survey of Biloxi Harbor, and in accordance with this provision a report upon this locality was submitted under date of February 16, 1882.

The first appropriation for this improvement, which was carried by the act of August 2, 1882, provided for improving the roadstead north of Deer Island, which leads into the Back Bay of Biloxi, but in the act of July 5, 1884, and before any work in connection with the improvement was accomplished, the money appropriated by the act of 1882 was made available for the formation of a channel from Mississippi Sound across the shoal at the western end of Deer Island to the wharves at Biloxi. A project for the formation of a channel 8 feet deep and 150 feet wide between Mississippi Sound and Biloxi, at an estimated cost of $55,000, was then adopted. The work of dredging under this project was commenced in September, 1887, and was completed in 1892, at a cost of $34,148.64. The balance of the appropriations to the extent of $10,233.63 was subsequently applied to the work of removing shoals which had formed in the lower part of the dredged cut. In August, 1893, the dredged channel, which is about 6,000 feet long, was found to have a minimum depth of 9 feet and a minimum width of 160 feet. The total amount appropriated to that date was $45,000, and the expenditures in obtaining the completed channel were $44,382.27.

No further appropriation was made until 1902, when the river and harbor act of that year appropriated the sum of $10,000 for continuing the improvement of the harbor at Biloxi. A survey made in October, 1902, shows that in the nine years intervening between the supension of work and the present time, the channel has shoaled generally from 1 to 2 feet throughout its length.

The approved project for the expenditure of the funds now available for the improvement of Biloxi Harbor provides for the work of removing shoals and obstructions in the existing channel of approach to the harbor by dredging to a depth of 8 feet at mean low water over a width of 150 feet and over a length of about one mile. This work of dredging will probably be undertaken during the current year.

Previous examinations and surveys.—On January 23, 1897, a report was submitted by this office to the Chief of Engineers, United States Army, in compliance with a provision of the river and harbor act of June 3, 1896, calling for a survey for determining the most practicable route for a deep-water channel leading from Ship Island Harbor to the mainland on the coast of Mississippi. In this report the probable work involved, in order to obtain channels from Ship Island Harbor to Pearl River, Gulfport, Biloxi, and Pascagoula River, was compared. As a result of this comparison, it was stated that the most practicable of these routes was the one to Biloxi, and that the cost of dredging a channel 300 feet wide and 23 feet deep at low water to this point would be $812,500. Such a channel was, however, stated to be unworthy of improvement, owing to the proximity of Mobile Harbor on one side and New Orleans on the other, both improved at great cost, and owing to the fact that if a channel were dredged by the Government to any one of the points on the coast of Mississippi under consideration the benefit of such a channel would be mainly local.

By an act of Congress approved June 16, 1898, a survey of the channels from Ship Island Harbor to Gulfport, Miss., and Biloxi, Miss., was ordered. This survey was made in November and December, 1898, and from data secured at that time various estimates for obtaining channels of different dimensions from Ship Island Harbor to the two points in question were made, the report upon the survey being submitted on December 17, 1898. Among the estimates were the following:

For 17-foot channel 300 feet wide to Front Bay at Biloxi, with anchorage basin	$669,249.49
For 17-foot channel 300 feet wide to Back Bay at Biloxi, with anchorage basin	1,144,566.02

These estimates are referred to in the present report with a view of indicating the cost of a channel of medium depth between Ship Island Harbor and Biloxi. No opinion was expressed in the report of 1898 as to the worthiness of the improvement.

Resources, industries, and commerce.—The country drained by the tributaries of the Back Bay of Biloxi is covered by yellow-pine timber of a good quality, but owing to the limited extent of tributary territory the supply of timber can not last for many years. Owing to the existence of the Pascagoula River on the east and the Pearl River and the Gulf and Ship Island Railroad on the west, the timber and other products from adjacent portions of this State do not seek Biloxi as an outlet. The town has advanced in wealth and population, owing to its business houses and industrial establishments (the latter consisting principally of factories canning sea foods) and to its importance as a pleasure resort. Information concerning the town and its trade has been furnished this office by the Biloxi Commercial Club, an organization including representatives of all the principal industries and business establishments of the town. This information is as follows:

(*a*) Population of city: 7,000.

(*b*) Industries of city: 5 canning factories; 1 sawmill; 1 sash, door, and blind factory; 5 shipyards; 1 flour mill; 4 houses shipping raw oysters; 1 brickyard; and 2 machine shops.

(*c*) Combined annual business: $4,500,000.

(*d*) Number of hands employed in the factories: 1,700.

(*e*) Number of vessels used at present in connection with industries of city: 220 schooners and 12 tugs.

(*f*) Tonnage of vessels: 170 schooners average 14 tons net, 12 tugs average 23 tons net and 42 tons gross, custom-house measure.

(*g*) Number of men employed on vessels: 860.

(*h*) Number of trips made during year and quantity of cargo carried: The schooners pass in and out of Biloxi Harbor on an average of about thirty-five times during the year. Some of the tugboats pass in and out nearly every day. The amount of cargo carried can not be determined accurately, but it consists to a large extent of oysters and other sea food.

(*i*) Benefits accruing from improvements already made: Larger vessels are able to navigate the harbor, while increased dispatch is experienced in handling cargoes owing to vessels not having to wait for tides.

(*j*) Difficulties and handicaps experienced at present owing to insufficiency of water: Vessels drawing 8 feet can not navigate the channel safely; some of the larger tugboats waste time waiting for the tide; the large schooners are unable to complete their cargoes inside; while the port is losing trade which would come to it were additional improvements made.

(*k*) New industries which would follow improvements in Biloxi Harbor: The lumber exporting business, sawmills, woolen mills, cotton mills, cotton compresses, and deep-sea fishing industries.

(*l*) Amount of money which would probably be invested in new industries: $1,000,000 to $5,000,000.

(*m*) Number of hands which would probably be employed in new industries: 500 to 3,000.

Transportation facilities.—Biloxi has but one railroad, which, however, affords communication to all points in the north, east, or west. It is improbable that any export freight will ever seek an outlet from Biloxi from this road owing to the existence of deep-water terminals in the near vicinity. In its present condition Biloxi Harbor offers facilities for water communications for vessels of a draft of about 7 or 8 feet and after the expenditure of the money now available for this locality a maximum high-water draft of about 9 or 10 feet will be possible. The construction of an electric railway from Biloxi to Mississippi City and Gulfport is in contemplation. No towns or settlements of any size are immediately tributary to Biloxi.

Nature of improvement desired.—The river and harbor act of June 13, 1902, makes provision for the preliminary examination of a channel from Biloxi to Ship Island Harbor, Mississippi, with a view to obtaining additional depth and width. A channel 13 feet deep and 300 feet wide between Ship Island Harbor and Biloxi is desired by the navigation interests of the port, as set forth in a letter from the Biloxi Commercial Club hereto appended.

Probable cost of improvement desired.—A channel 13 feet deep and 300 feet wide leading to Biloxi from Ship Island Harbor would probably require the removal of 1,000,000 yards of material, place measurement, which at 20 cents per cubic yard (18 cents for dredging and 2 cents for contingencies) would cost $200,000. The maintenance of this channel would be greatly assisted by the construction of a dike extending out from the shore along the western side of the cut, in order to train the currents passing around the western end of Deer Island.

Conclusion.—The conditions adverse to the worthiness of the improvement of Biloxi Harbor have been greatly augmented since the submission of the report upon the survey referred to in paragraph 4 by the provisions recently made by Congress for obtaining a 17-foot channel into the Pascagoula River, 20 miles to the east of Biloxi, and for a 19-foot channel at Gulfport, 12 miles to the west, and the opinion expressed in that report that a channel to afford deep water to Biloxi was unworthy of improvement is therefore warranted now to even a greater extent than at that time.

The Pascagoula River drains an area of about 8,000 square miles, embracing almost the entire southeastern part of the State of Mississippi, and the port of Pascagoula is therefore tributary to the large areas of timber land which exist in this portion of the State. This timber, after being manufactured at the mills on the lower Pascagoula, is exported from that point. Gulfport, on the other hand, has no tributary watershed, but is brought into communication with the timber lands in the southern part of the State by means of a railroad running north and south. With the natural and artificial lines of transportation leading to other points on the coast, the commerce of Biloxi represents now, and will probably continue to represent, the result of the production and consumption of the town itself. In view, then, of the provisions heretofore made for deep-water harbors in this immediate vicinity, and in view of the local nature of the commerce of Biloxi, the harbor at this point is deemed unworthy of extended improvement by the General Government, and a channel which will enable the small vessels and tugboats which navigate the sound to enter and depart at all stages of the tide is considered all that is warranted by the present and prospective commerce of the port.

It is believed that a channel which will afford a depth of not less than 10 feet at mean low water will be ample for this locality. The cost of a partly protected channel 10 feet deep and 200 feet wide is estimated at about $75,000. A detailed survey upon which to base a closer estimate will cost about $750. No consideration has been given in this report to the possibility of a channel around the eastern end of Deer Island, as this channel is not in the direction of traffic, and is not, therefore, navigated to any extent.

Respectfully submitted.

David G. Anderson,
Assistant Engineer.

Capt. Spencer Cosby,
Corps of Engineers.

LETTER OF THE BILOXI (MISS.) COMMERCIAL CLUB.

The Biloxi Commercial Club,
Biloxi, Miss., January 17, 1903.

Dear Sir: Replying to your favor of the 16th instant, there is abundant safe anchorage in this harbor 13 feet in depth at mean low tide.

In the opinion of the club, the maritime interests of this port require a channel 13 feet in depth and 300 feet in width from this to Ship Island Harbor.

Very respectfully,

The Biloxi Commercial Club,
Chas. Isom, *Secretary.*

Mr. David G. Anderson,
Assistant Engineer.

R 13.

PRELIMINARY EXAMINATION OF CHICKASAHAY RIVER TO BUCATUNNA, MISSISSIPPI.

[Printed in House Doc. No. 230, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith, for transmission to Congress, a report, dated June 9, 1903, by Capt. W. E. Craighill, Corps of Engineers, on preliminary examination of Chickasahay River to Bucatunna, Miss., authorized by the river and harbor act approved June 13, 1902.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of said act, and attention is respectfully invited to the Board's report of July 29, 1903, in third indorsement thereon.

Chickasahay River has been under improvement since 1891, and since 1896 operations have been confined to the section of the river now under consideration, i. e., from the mouth up to Bucatunna. Obstructions have been removed to secure a practicable channel at high water, and this improvement is now being maintained under appropriations for that purpose made by Congress.

It is the unanimous opinion of the district officer, of the division engineer, Lieut. Col. H. M. Adams, and of the Board of Engineers for Rivers and Harbors that the needs of commerce on this stream will be fully met by such work of maintenance, and that no increase in the requirements of the existing project is desirable. The Board recommends that maintenance under the existing project be continued, and in this recommendation I concur. The estimated cost of this work is $2,500 annually.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. W. E. CRAIGHILL, CORPS OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,
Mobile, Ala., June 9, 1903.

GENERAL: In compliance with instructions contained in Department letter dated July 12, 1902, I have the honor to submit the following report upon the preliminary examination of Chickasahay River to Bucatunna, Miss., provided for by the river and harbor act of June 13, 1902:

Preliminary examinations of this stream were made in 1879 and 1889. (See Annual Reports of the Chief of Engineers for 1879, p. 841, and 1889, p. 1463.) Since 1891 the Chickasahay River has been under improvement by the removal of logs, snags, and overhanging trees, so as to provide a channel for the passage of log rafts, the total amount appropriated for this purpose having been $21,750. Since 1896 by the terms of the appropriation act the improvement has been limited to the part of the river from the mouth up to the railroad bridge near Bucatunna, Miss. The present examination, it is understood, is to cover the portion of the river now under improvement—namely, from the mouth to Bucatunna.

When the improvement of this stream was commenced, it was so much obstructed by overhanging timber, snags, etc., as to be practically useless for the purpose to which it is now put, i. e., the logging business. Probably if this improvement were abandoned it would return in a short time to its former condition, thus cutting off one of the sources of supply of logs for the mills at Moss Point, East Pascagoula and Scranton, Miss. There is no steamboat navigation on the river, and it is probable there will never be any of importance. The value of the logs and timber floated down the Chickasahay River annually is estimated to be between three and four hundred thousand dollars.

I am of the opinion that the Chickasahay River to Bucatunna, Miss., is only worthy of improvement by the General Government to the extent of maintaining, at an annual cost of about $2,500, the high-water channel obtained by the expenditure of previous appropriations, and for this reason, no increase in the existing project for the improvement of the river is recommended.

The following extracts are from the report of Assistant Engineer David G. Anderson, and give the physical characteristics of the stream and other interesting data:

I have the honor to submit the following report upon a preliminary examination of the Chickasahay River to Bucatunna, Miss., made in accordance with a provision contained in the river and harbor act of June 13, 1902. This examination was undertaken in compliance with your instructions, and was completed on May 6, 1903:

Geographical location.—The Chickasahay River is formed by the junction of two small creeks in the eastern-central portion of the State of Mississippi. The river flows in a southerly direction from 5 to 20 miles west of the Alabama-Mississippi State line, finally joining the Leaf River, at a point about 45 miles north of the coast line, to form the Pascagoula River, which eventually empties into Mississippi Sound. The Chickasahay River flows through Clarke, Wayne, and Greene counties, Miss., and drains a watershed of about 3,000 square miles in extent. The distance from its head to its mouth in a direct line is about 80 miles, although following the wanderings of the stream the distance is perhaps twice as great.

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Previous improvements.—Although the Chickasahay River was reported upon in 1879, with a recommendation for an appropriation if the work was determined upon, a project for its improvement was not adopted by Congress until after the examination of 1889. The first appropriation was made in 1890, the project adopted at that time providing for the formation of a clear, low-water channel from the mouth to the railroad bridge at Shubuta, Miss., a distance of 130 miles, by the removal of logs, snags, and overhanging trees, at an estimated cost of $30,000, and $5,000 annually to preserve the improvement. Appropriations for this work have been made as follows:

Act of September 19, 1890	$5,000
Act of July 13, 1892	5,000
Act of August 18, 1894	5,000
Act of June 3, 1896	2,000
Act of March 3, 1899	2,500
Act of June 13, 1902 (allotted)	2,250
Total	21,750

The work of improvement was commenced on October 31, 1891, and up to June 30, 1896, the river channel had been cleaned out from the mouth as far up as Waynesboro, which is about 15 miles below Shubuta. No work was accomplished above the former point. The river and harbor act of June 3, 1896, carried an appropriation of $2,000 for the continuation of the Chickasahay River improvement, the provisions of this act with reference to this appropriation being as follows:

"Improving Chickasahay River, Mississippi, from the mouth up to railroad bridge, near Bucatunna: Continuing improvement, two thousand dollars."

This limiting of the extent of the improvement was considered as permanently modifying the project by changing the upper limit of the work from Shubuta to Bucatunna, 50 or 55 miles farther south, so that subsequent appropriations have been applied entirely to the maintenance of the existing channel between the mouth and Bucatunna, and the allotment from the appropriation made by the river and harbor act of June 13, 1902, for improving Pascagoula River and its tributaries, the Chickasahay and Leaf rivers, Mississippi, will be applied during the present season to the improvement of the channel within the same limits.

Resources and commerce.—The Chickasahay River flows through a country which is covered with long-leaf yellow pine, a great part of which is dependent upon this stream for transportation to the mills and market. The country traversed by the stream is sparsely settled, except for the short distance above Bucatunna, where it is paralleled by the Mobile and Ohio Railroad, along which several small towns are located. No steamboat navigation exists on the river at present, and continuous navigation of this character by boats of any size is made impossible by fixed bridges across the stream at various points. The stream is devoted entirely to the rafting of logs and timber at high-water stages, to the mills and tide water at Moss Point, and to the barging of rosin and turpentine. Exact figures as to the logs and timber floated down the Chickasahay River during the past season are difficult to obtain, but it is believed that the business amounted to about $300,000 or $400,000.

Respectfully submitted.

W. E. CRAIGHILL,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., July 2, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of the district engineer officer that the Chickasahay River to Bucatunna, Miss., is only worthy of improvement by the General Government to the extent contemplated by the existing project.

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
July 8, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 29, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of "Chickasabay River to Bucatunna," Miss., the indorsement of the division engineer thereon, and other data available, including communications from interested parties.

This river has been under improvement since 1891. The original project provided for obtaining a high-water channel from the mouth of the river up to Shubuta, Miss., a distance of 130 miles, by the removal of obstructions and overhanging trees. The commerce to be benefited consists of logs, which are rafted down the Chickasahay and Pascagoula to the mills at the mouth of the latter. The river and harbor act of 1896 modified the project by limiting the improvement to the 75 miles between the mouth of the river and Bucatunna. Of late work has been confined to maintaining the channel by the removal from time to time of obstructions and overhanging trees. At the close of the fiscal year 1900 the condition of the river was such as to permit of its navigation by light-draft boats up to the railroad bridge near Bucatunna at a 4-foot stage. Up to June 30, 1902, $19,500 had been expended, of which $7,100.27 was for maintenance. The river and harbor act of June 13, 1902, contained the following appropriation: "Improving Pascagoula River and its tributaries, the Chickasahay and Leaf rivers, Mississippi: For maintenance, eight thousand five hundred dollars."

It appears from communications received from interested parties that a more extensive improvement of the river than has already been attained is not desired. It is stated that the only important traffic on the river is log rafting, and that this will be amply served by snagging. This work is continuing in its nature, and unless it is done from year to year, or at least at frequent intervals, the benefit is lost.

It is the opinion of the district officer and the division engineer that the needs of commerce on this stream will be fully met by the maintenance, at an annual expense of about $2,500, of the high-water channel obtained by the expenditure of previous appropriations, and that for this reason no increase in the requirements of the existing project is desirable. The Board concurs in this opinion and recommends that maintenance under the existing project be continued and that appropriations for this purpose be made at the annual rate recommended by the district officer.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

R 14.

PRELIMINARY EXAMINATION OF FISH RIVER, ALABAMA.

[Printed in House Doc. No. 234, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report dated February 6, 1903, by Capt. Spencer Cosby, Corps of Engineers, on preliminary examination of Fish River, Alabama, ordered by the river and harbor act approved June 13, 1902.

This stream has two distinct branches, which are known as the North Prong and the East Prong, respectively, the latter being also known and referred to in this report as Magnolia River. These branches empty separately into the body of water known as Weeks Bay, the latter in turn emptying into Mobile Bay, and the improvement desired is a channel 8 or 10 feet deep at low water and about 100 feet wide at the bottom through the flats in Weeks Bay and through the outer bar, so as to permit vessels of from 6 to 8 feet draft to enter the river at all stages of the tide.

Captain Cosby is of opinion, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, that the locality is not worthy of improvement; and in the opinion of the Board of Engineers for Rivers and Harbors, which has reviewed this report in accordance with the provisions of sections 3 and 14 of the above-mentioned act, it is not desirable for the United States to undertake this work.

The views of the Board are concurred in by me.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. SPENCER COSBY, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., February 6, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of Fish River, Alabama, made in accordance with a provision contained in the river and harbor act of June 13, 1902. This report is based upon data secured and an examination of the locality made by Assistant Engineer D. G. Anderson.

Geographical location.—Fish River is located in the southern part of Baldwin County, Ala., and is a tributary of Mobile Bay. Baldwin and Mobile counties are the two counties in Alabama which border on the Gulf of Mexico, the former being east of Mobile Bay and the latter west of it. Fish River has two distinct branches, which are known as the North Prong and the East Prong, respectively. The latter is also known as Magnolia River, and this name will be applied to it in this report to distinguish it from the North Prong, or Fish River proper. The two branches empty separately into a body of water known as Weeks Bay, the latter in turn emptying through a narrow mouth into Mobile Bay at a point 15 miles northeast of Fort Morgan.

The distance from the mouth of Weeks Bay to the head of Fish River is about 25 miles, while the corresponding distance on Magnolia River is about 10 miles. The two streams drain an area of not more than 225 square miles, or about one-eighth of the area of the county in which they are located.

The entire population of Baldwin County, according to the census of 1900, was about 13,000, and of this population it is believed that less than 800 people live in the area drained by the branches of Fish River.

Physical characteristics.—The approach to Fish River is across the flat slope of Mobile Bay. The 12-foot contour in the bay is about 5 miles from the mouth of the river (i. e., the entrance to Weeks Bay), while the 9-foot contour is about 1¼ miles from the same point. From the 9-foot contour the water shoals up rapidly until the crest of the outer bar is reached, about five-eighths of a mile from the entrance.

In the channel used by vessels running in and out of Fish River, where the depths are probably greater than elsewhere in the vicinity, minimum low-water soundings of from 4½ to 5 feet were obtained on the bar. The length of this shoal between the 6-foot contours is probably about one-half mile, after which the channel deepens rapidly until the narrow outlet from Weeks Bay is reached. The maximum depth at the mouth, where the channel is from 600 to 700 feet wide, is 28 feet.

Having passed the entrance, Weeks Bay is encountered. This bay, roughly speaking, is diamond-shaped, with its major axis, about 3 miles long, extending from the mouth of the bay to the mouth of Fish River, and its minor axis at right angles thereto, about 2 miles long, extending on the east to the mouth of Magnolia River.

The bottom of the bay is practically flat, with low-water depths of from 3 to 3½ feet. The material composing the bottom is a very soft mud, into which a pole may be driven 5 feet with but little effort. Through this soft bottom a narrow channel, about 20 feet wide and 5 or 5½ feet deep, has been churned by the screws of the light-draft tug boats which navigate Fish River. This channel leads to Fish River proper, the entrance to Magnolia River being shallower and much more difficult of access.

When the branches of the river are reached the depths increase immediately. In Fish River the channel ranges generally from 12 to 25 feet in depth, with a width of 600 feet at the mouth, the width gradually diminishing upon ascending the stream. In Magnolia River the depths range from 8 to 20 feet, with widths somewhat less than those in Fish River.

The obstructions to navigation consist, therefore, of the bar off the entrance to Weeks Bay and of the long extent of mud flats through the latter body of water. During the winter, with the tide 1 or 2 feet below normal, the depths across these obstructions are insufficient for any boats except those of the lightest draft.

Resources and commerce.—The territory tributary to Fish River was originally timbered, but is now to a great extent in process of transition to agricultural uses. The timber in this locality has been rather generally cut off, and such timber lands as are now being utilized yield but 3,500 to 4,000 feet B. M. per acre. Timber is being cut extensively by only one firm at present. This firm operates a logging railroad near Fish River, thereby enlarging the territory tributary to the stream. The logs are rafted from Fish River into Mobile Bay and conveyed to another stream upon which the mills belonging to the firm are located. About 300,000 logs are now rafted from the river each year in this manner.

There are at present three or four sawmills on the river shipping manufactured lumber, and one turpentine still. A canning factory, additional turpentine stills, and two or three other industries are in prospect, but their establishment is not assured. Seven or eight general stores are located on or near the river, serving the needs of the locality, and in addition there are hotels and boarding houses at Magnolia Springs, on Magnolia River, capable of accommodating several hundred guests. No towns exist in the immediate vicinity.

A fairly large extent of property near Fish River has recently been divided up into small tracts by development companies and sold to settlers for agricultural purposes. In this manner a considerable influx of population has occurred during the past few years, and quite an extent of land has been devoted to raising fruit and produce. This population is scattered, however, and no figures as to its numbers or the acreage of land utilized agriculturally could be obtained.

Transportation facilities.—Mobile, being the nearest city to the Fish River territory, is the base of supplies and the shipping point for that section of the country. No continuous overland communications, however, exist between Mobile and lower Baldwin County. Owing to the cost of transshipping and hauling over 8 or 10 miles of poor roads, shipments to and from the Fish River territory are made entirely by water, and are consequently affected both in the matter of regularity and cost by the shallow depths existing off the mouth of the river and through Weeks Bay.

At the present time a steamboat 120 feet long and with a beam of 22 feet, designed to draw 28 inches of water without cargo, is under construction at Marlow, Baldwin County, Ala., and upon its completion in the course of a few months it is the intention of the owners to place the vessel in service between Fish River and Mobile as a regular passenger and freight boat. The disadvantage of a boat of this type is that it is not adapted to the heavy seas and bad weather sometimes encountered in Mobile Bay. Freight for Fish River is at present handled on small schooners and naphtha boats, which make irregular trips in and out of the stream.

Present amount of commerce.—The incoming freight using Fish River amounts to not over 2,500 or 3,000 tons a year, and consists of general supplies. Outgoing freight comprises the logs heretofore referred to, about 4,000,000 feet B. M. of manufactured lumber, and shipments of produce the amount of which could not be ascertained. The combined business of the general stores tributary to the river is probably between $50,000 and $100,000 annually.

In the event of any improvement being effected, the shipments of logs and lumber would increase, although, owing to the limited territory tributary to the river, the supply of timber will probably become exhausted within a comparatively few years. Shipments of turpentine and rosin would increase, and the farm lands, being in more reliable communication with the markets, would be tilled to a greater extent, thereby increasing the shipment of farm products.

Nature of improvement desired.—A channel 8 or 10 feet deep at low water, and about 100 feet wide at the bottom, is desired through the flats in Weeks Bay and through the outer bar, so as to permit vessels of from 6 to 8 feet draft to enter the river at all stages of the tide.

Probable cost of improvement desired.—A channel 8 feet deep at mean low water leading to both branches of the river would require dredging over a length of 3½ miles, if not more. Owing to the fact that most of this cut would be through mud flats having present depths of 3 or 3½ feet, the channel would require the removal of at least 20 cubic yards, place measurement, to the running foot, or about 370,000 cubic yards, place measurement, for the entire distance. The water is so shoal that a grapple dredge could not perform this work to advantage, owing to the difficulty of handling scows, while its performance by a hydraulic machine would be dependent upon the accessibility of such a plant. In either event, owing to the soft bottom, the cut would tend to fill in rapidly, and the maintenance of the channel would prove expensive. Placing the price of dredging as low as 20 cents per cubic yard, the resulting probable cost of obtaining such a channel is at least $74,000. Protecting works for the maintenance of the channel would cost nearly as much more.

Conclusion.—In view of the limited amount of commerce on the river under examination, of its local nature, and of the comparatively great expense of carrying out and maintaining any adequate plan of improvement, I am of the opinion that Fish River is not worthy of improvement by the General Government. A survey of the stream, if ordered, would cost about $600.

Very respectfully, your obedient servant,

SPENCER COSBY,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., February 7, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of Captain Cosby that the locality is not worthy of improvement by the General Government.

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
February 17, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

Papers in this case on file in this office are herewith.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., April 13, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has fully considered the within report of the district officer, the indorsement of the division engineer thereon, and several letters from interested parties.

In view of the limited amount and local character of the commerce involved, the great expense of carrying out and maintaining any adequate plan of improvement, and the sparse population of the section of the country to be benefited, the Board is of the opinion that no commercial results commensurate with the expense can be expected from any improvement of Fish River, Alabama, and therefore believes that it is not desirable for the United States to undertake this work.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

R 15.

PRELIMINARY EXAMINATION AND SURVEY OF HORN ISLAND PASS, MISSISSIPPI.

[Printed in House Doc. No. 506, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, February 2, 1904.

Sir: I have the honor to submit herewith reports dated June 9 and November 7, 1903, by Capt. W. E. Craighill, Corps of Engineers, on preliminary examination and survey, respectively, of Horn Island Pass, Mississippi, with a view to securing a channel 25 feet deep and of suitable width, together with a supplemental report of December 26, 1903, made in pursuance of a requirement of the river and harbor act of June 13, 1902.

In the opinion of Captain Craighill, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, the interests involved at Horn Island Pass are sufficiently large to render the locality worthy of improvement by the General Government, provided effective results can be accomplished within a reasonable limit of cost.

In his report on survey the district officer presents a plan for improvement which contemplates the formation of an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island Pass, a connecting channel between the anchorage basin and the throat of the pass 24 feet deep and 200 feet wide, and a 25-foot channel 300 feet wide across the outer bar, at an estimated cost of $225,000, which includes $55,000, one-half the estimated cost of building a dredge for use on this and other works in the same district. In forwarding this report the division engineer expresses the opinion that the present and prospective commerce does not justify the Government in incurring the expense of forming and maintaining a channel 25 feet deep through Horn Island Pass.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors under the provisions of sections 3 and 14 of the above-mentioned act, and attention is invited to the Board's reports on the subject in indorsements of July 11 and December 15, 1903, and of January 5 and January 30, 1904; also to the supplemental estimate, prepared by Captain Craighill at the instance of the Board, of the cost of a 21-foot channel through Horn Island Pass on the lines laid down in his report on survey.

This locality has heretofore been improved by the United States by dredging a channel 200 feet wide with a depth from 20 to 20½ feet, and there is now a depth of 18 feet through Horn Island Pass connecting the harbor with deep water in the Gulf. The Board of Engineers states in its report of December 15, 1903, that it is not believed that the act of June 13, 1902, contemplated the deepening of the harbor proper and that the improvement of the pass to a greater depth than 21 feet would serve no useful purpose. It concludes in its later report of January 30, 1904, that in view of the facts summarized therein it is advisable to provide through Horn Island Pass a channel 21 feet in depth, 300 feet wide across the outer bar and 200 feet wide elsewhere, connecting the natural anchorage with the deeper water of the Gulf to be accomplished by the use of a Government plant, to be temporarily loaned from some other improvement, at an estimated first cost of $40,480 and $9,000 annually for maintenance.

I agree with the opinion that it is inadvisable to expend on this improvement so large a sum as the estimated cost of a 25-foot channel and anchorage basin, and that it is advisable to provide a 21-foot channel if this can be effected at the price of 11 cents per cubic yard named by the Board. This price is much less than any probable bid if the work be let by contract, since contractors' plants are not usually equipped for bar dredging. The amount of work at Horn Island does not justify the construction of a special plant, and it appears that the only way of bringing the work within the estimate is to do it with Government plant belonging to some other improvement, borrowed for this work at some time when it would otherwise be idle. It can not be stated with certainty when such a plant will become available in this manner, and for this reason the improvement must wait a favorable opportunity for its execution, and if money be appropriated for it, it should be with the understanding that the funds must remain unexpended until the necessary plant belonging to some other improvement can be spared from its work elsewhere.

With this statement, I concur in the views of the Board.

Very respectfully, your obedient servant,

A. Mackenzie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. William H. Taft,
Secretary of War.

PRELIMINARY EXAMINATION OF HORN ISLAND PASS, MISSISSIPPI.

Engineer Office, United States Army,
Mobile, Ala., June 9, 1903.

General: In compliance with instructions contained in Department letter dated July 12, 1902, I have the honor to submit the following report upon the preliminary examination of Horn Island Pass, Mississippi, with a view to a channel of 25 feet depth and suitable width, provided for by the river and harbor act of June 13, 1902.

Examinations of this locality have been made as follows:

In 1882 (see Annual Report of the Chief of Engineers for 1882, p. 1324); a survey in 1896 (see Annual Report of the Chief of Engineers for 1897, p. 1716); a survey in 1898 (see Annual Report of the Chief of Engineers for 1899, p. 1784).

Under the provisions of river and harbor acts of August 18, 1894, and June 3, 1896, a channel 200 feet wide, with depths of from 20 to 20½ feet, was dredged. A survey made about fifteen months after the completion of this work showed that the channel had shoaled to a depth of 19 feet in that space of time. The shoaling, however, occurred only at isolated points in the channel, and the pilots claim that it was caused by the grounding of vessels in the cut.

The business interests concerned in the improvement of Horn Island Pass are principally lumber shippers at Scranton, Mosspoint, and East Pascagoula, Miss. In many cases they now find it necessary to load heavy vessels at Ship Island because of the lack of sufficient depth of water on the bar at Horn Island Pass. The harbor at Horn Island would be better for them than the one at Ship Island, both on account of the shorter haul, and because at Horn Island, on account of the local conditions, a less amount of lumber is lost in loading the ships. It is estimated by the Pascagoula Commercial Club that about $56,000 a year would in this way be saved to the lumber interests, by being able to load at Horn Island instead of at Ship Island. The annual exports by water from points that would use Horn Island Pass if it were sufficiently improved amount to about 162,000,000 feet of lumber. It is probable, in my opinion, that this channel could be maintained by a seagoing dredge, whose time would be distributed between it, Mobile bar, and Ship Island Pass.

I am of the opinion that the interests involved at Horn Island Pass are sufficiently large to render the locality worthy of improvement by the General Government, provided effective results can be accomplished within a reasonable limit of cost. As the probable cost of the work can only be determined after a complete survey and after an investigation of the most economical method of performing the work, including the possibility of securing Government plant for its execution, I recommend that the necessary surveys be authorized at a cost not to exceed $1,500.

The following extracts are from the report of Assistant Engineer David G. Anderson, and give the physical characteristics of the locality and other interesting data:

I have the honor to submit the following report upon a preliminary examination of Horn Island Pass, Mississippi, with a view to a channel of 25 feet depth and suitable width, made in compliance with a provision contained in the river and harbor act of June 13, 1902. This examination was completed in accordance with your instructions on May 18, 1903, the general information regarding this locality having been obtained at various times prior to that date.

Geographical location.—The Gulf coast of the State of Mississippi and of a part of the State of Alabama is protected by a chain of islands stretching east and west, parallel to the mainland and about 8 or 10 miles distant therefrom. The body of water intervening between these islands and the mainland is called Mississippi Sound and extends from Mobile Bay on the east to Lake Borgne on the west. The waters of Mississippi Sound are protected to a great extent by the chain of islands referred to, and although the general depths in the sound are shoal yet just north of two of the islands there are sheltered anchorage sites with low-water depths ranging from 18 to 30 feet. These anchorages connect with the Gulf of Mexico by means of passes between the islands, and for want of natural deep-water harbors along the mainland in this immediate vicinity the pockets in question have been and are extensively used as loading points for deep-draft vessels. The names of these two anchorages are Ship Island Harbor and Horn Island Harbor, the latter being just north of Horn Island, while between the latter island and Petit Bois Island and some 7 miles west of the Alabama-Mississippi State line is Horn Island Pass, which is now under examination.

Physical characteristics.—The channel through Horn Island Pass has all the characteristics of an ocean inlet. Petit Bois Island to the eastward has a length of about 12½ miles, while Horn Island to the westward has an extent of 15 miles, the opening between them being about 1¾ miles wide. The waters of Mississippi Sound in this vicinity evidently set toward the south on the ebb tide until the currents are deflected, concentrated, and trained along the northern shores of the islands, thereby producing deep water at these localities. The currents from the pockets finally round the ends of the islands and flow through the pass into the Gulf of Mexico.

A careful comparison of Coast Survey charts of various dates shows that the depths through Horn Island Pass have been gradually increasing for some years past. The earliest accessible hydrography of this vicinity, that of 1860, shows minimum depths of 14 to 15 feet across the bar. In 1873 these depths had increased to 16 or 17 feet; in 1896 there was reported to be 18½ feet, while at the present time there is believed to be 19 or 19½ feet of water in it. Upon investigation it can be seen that this deepening is caused by the contraction of the pass opening, due to the steady growth of Petit Bois Island toward the west. While the eastern end of Horn Island shifts its position from time to time, this portion of the island has not cut away as rapidly as the western end of Petit Bois Island has advanced, so that while the opening between these islands was over 3 miles wide in 1860, in 1896 it had diminished to perhaps 1¾ miles. The comparison also shows, as might be expected in the case of an ocean bar, that the channel shifts its location from time to time, under the influence of the forces which are at work in this vicinity. Owing to the fact that the ebb current flowing along the north side of Horn Island is toward the east, while the littoral currents outside the bar are toward the west, the channel of the pass has generally followed a curved path, the concavity, of course, being toward the west. The data at hand are not sufficient to determine the oscillations in width and depth, or the range in the position of the channel, which are included in the cycle of changes in progress at this locality. In its present condition the pass consists of an outer bar and an inner bar separated by a deeper pocket immediately between the ends of the adjacent islands. The minimum depths over the outer bar are about 19 to 19½ feet, while over the inner bar they are slightly greater. In the intervening area of deep water the soundings run up to 25 or 27 feet. The distance from the eastern end of the Horn Island anchorage to deep water in the Gulf of Mexico, following the existing channel, is about 3 miles, and quite an extent of this distance will probably require dredging in order to obtain a 25-foot channel.

* * * * * * *

Resources, industries, and commerce.—Horn Island Harbor is 9 miles south of the mouth of the Pascagoula River and is the natural outlet for the commerce of that stream. The Pascagoula River is tributary to an extensive area of yellow-pine forest lands in the southeastern part of the State of Mississippi. Extensive sawmills are located on the lower part of the river, and the pine logs, after being floated down the river to the mills, are manufactured into lumber and timber for shipment by water to coastwise or foreign ports. The lower Pascagoula River has a present depth of about 12 feet, so that small vessels load their cargoes directly at the mills. Larger vessels take on their cargoes in the lower sound, off the mouth of the river and in Horn Island Harbor, the lumber being shipped out to the loading point on barges or in rafts, but deep-draft vessels loading cargoes from the Pascagoula mills are obliged to seek Ship Island anchorage, 20 or 25 miles to the westward, owing to lack of depth through Horn Island Pass. At Ship Island vessels up to about 25 or 26 feet draft can be loaded, whereas the maximum possible draft that can be carried through the pass at Horn Island is 20½ feet. The long tow to Ship Island, in conjunction with the fact that a portion of the distance, between the ends of Horn and Ship islands, is considerably exposed, makes the transportation of lumber and timber on barges or in rafts to that place expensive, uncertain, and more or less hazardous. It is with a view of saving the expense of the long and uncertain tow to Ship Island that the interests of the Pascagoula River desire the deepening of Horn Island Pass, in order to permit deep-draft vessels to have access to Horn Island Harbor. The present project for the improvement of the Pascagoula River contemplates the formation of a 17-foot channel.

With the completion of this channel and the deepening of Horn Island Pass deep-draft vessels could take on a large portion of their cargoes at the mills, finish loading at Horn Island, and proceed directly to sea with a minimum expense for loading. The lumber interests at this locality are predominant and represent practically the entire business that would be directly affected by the improvement of Horn Island Pass. Full figures in regard to the commerce of the Pascagoula River and various arguments in favor of the improvement of Horn Island Pass are given in the accompanying statements, which have been prepared by the Pascagoula Commercial Club. Attention is respectfully invited to these papers for a full statement of the facts bearing upon the improvement of Horn Island Pass. An analysis of these figures shows that for the fiscal year ending June 30, 1902, the business of the Pascagoula mills amounted to about 178,000,000 feet B. M. of lumber and timber. Of this amount some 16,000,000 feet were shipped by rail, while the remaining amount, 162,000,000 feet, was shipped by water. A little less than one-half the water shipments passed through the Horn Island channel, while the balance of the exports, amounting in value to $1,000,000, was loaded in deep-draft vessels, which were obliged to take on their cargoes at Ship Island. As is shown by the Commercial Club's statement, the tow to Ship Island is uncertain, expensive, and acts in various ways as a handicap to the business of Pascagoula River.

Nature of improvement desired.—A channel about 400 to 600 feet wide and 25 feet deep at mean low water is desired by the navigation interests using Horn Island Harbor. An examination of the Horn Island anchorage shows that there is but one 25-foot pocket in the whole extent of the anchorage and that this pocket is but one-quarter of a mile long. Without an immense amount of excavation the harbor itself could not be made available for 25-foot vessels. Owing to this circumstance, and to the fact that vessels in a seaway on an ocean bar require a safe margin of depth under their keels, it is believed that the navigation interests of Horn Island Pass are asking for a consideration of the merits of a project for affording loading and navigation facilities for vessels up to a draft of about 23 feet. Such a plan of improvement would be possible, as a small 23-foot pocket exists at the eastern end of Horn Island anchorage. Any deep channel through the pass will, however, require the improvement of the anchorage in order to be of complete benefit, as the general depths therein are only from 20 to 23 feet. As to the width of the channel, it is believed the cut through the pass need not be over 300 feet wide, this being the extent of the dredging performed at Ship Island and also the contemplated width of the channel across the outer bar of Mobile Harbor. The material to be removed is generally a hard sand, with possibly some mud, and the conditions of the work are such that it could not be performed economically by any other than a plant especially adapted for work in exposed localities; that is, by seagoing hydraulic dredges. Being exposed to the wind from practically all quarters, the bar is usually rough, except during certain changes in the weather, and the prosecution of the work with ordinary plant is therefore difficult.

The work previously performed under contract at Horn Island Pass in 1897 commanded a price of 40 cents per cubic yard, while the contract work in the anchorage in 1899-1901 brought 34 cents per cubic yard. Similar prices would make the performance of any further work at this locality unwarranted, but if the dredging can be performed by Government plant or otherwise at an economical rate the project appears deserving.

Respectfully submitted.

W. E. Craighill,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., July 2, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of the district engineer officer that the interests involved at Horn Island Pass, Mississippi, are sufficiently large to render the locality worthy of improvement by the General Government, provided effective results can be accomplished within a reasonable limit of cost, and also concurring in his recommendation that the necessary surveys be authorized at a cost not to exceed $1,500.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
July 8, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

A. Mackenzie,
Acting Chief of Engineers.

[Third indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., July 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer upon a preliminary examination of Horn Island Pass, Mississippi, "with a view to a channel of 25 feet depth and suitable width," the indorsement of the division engineer thereon, and other data available.

The Board is of the opinion that the present and prospective commerce of Horn Island Harbor is such as to render advisable the improvement of Horn Island Pass, provided such improvement can be effected at reasonable cost. The Board recommends that the district officer be authorized to make a survey and estimate of cost, and that for these purposes he be allotted the sum of $1,500.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
July 20, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Horn Island Pass, Mississippi, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors, in the preceding indorsement, I recommend that a survey of the locality as proposed be authorized.

A. MACKENZIE,
Acting Chief of Engineers.

[Fifth indorsement.]

WAR DEPARTMENT,
July 29, 1903.

Approved as recommended by the Acting Chief of Engineers.

By order of the Secretary of War:

J. B. RANDOLPH,
Acting Chief Clerk.

[Sixth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, November 28, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors with report of survey as recommended.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Seventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., December 15, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

In addition to the within report on a preliminary examination of Horn Island Pass, Mississippi, "with a view to a channel of 25 feet depth and suitable width," the Board has had before it at its session of this date the accompanying report on a survey of this locality with estimates of cost.

The principal business interest concerned in this improvement is the lumber trade from Scranton, Mosspoint, and East Pascagoula. In many cases the heavy draft vessels have to load at Ship Island because of the lack of sufficient depth of water at Horn Island. The Pascagoula Commercial Club estimates that about $56,000 per year would be saved to the lumber interests if Horn Island Harbor were as available as Ship Island Harbor. The annual exports that would use Horn Island if it were sufficiently improved amount to about 162,000,000 feet B. M. of lumber, about 270,000 tons.

The plan proposed by the district officer consists of the excavation of an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island, a connecting channel between the anchorage basin and the throat of the pass, also 24 feet deep and 200 feet wide, and a 25-foot channel, 300 feet wide, across the outer bar. The estimated cost of this work is $225,000, with an annual cost for maintenance, after completion, of $20,000. The district officer recommends the improvement of this locality to the extent indicated above.

The division engineer does not concur in the recommendations of the district officer. He states that—

> From the history of this locality, it is believed that the maintenance of a 25-foot channel through the outer bar, when obtained, would be a difficult, uncertain, and expensive matter. In view of the large cost of the improvement contemplated as compared with the probable benefit to commerce, and the fact that if such a channel is dredged by the Government the benefit will be mainly local, I am unable to concur in the opinion of the district engineer that this locality is worthy of improvement by the General Government to the extent indicated. In my opinion the commercial interests, present and prospective, involved do not justify the Government in incurring the expense for forming and maintaining a channel 25 feet deep through Horn Island Pass.

Attention is invited to the fact that the United States has recently deepened the entrance to the neighboring Ship Island Harbor to 26 feet. This harbor is but 24 miles distant from Horn Island Harbor, and the two are connected by the comparatively sheltered waters of Mississippi Sound. In any case lumber must be lightered from shore points to one of these harbors, and the measure of value of the Horn Island Harbor can not be greater than the saving in the distance which lighters must be towed.

The available low-water depth in Horn Island Harbor is 21 feet. There is a depth of 18 feet through Horn Island Pass, which connects the harbor with deep water in the Gulf. It is not believed that the act of June 13, 1902, contemplated the deepening of the harbor proper, and the improvement of the pass to a greater depth than 21 feet would serve no useful purpose.

The amount of material to be removed from the pass to produce a 21-foot channel is so small that the Board believes it desirable for the United States to undertake the work. The cost of maintenance will be absolutely small, but large in relation to the original cost of the work. In submitting this recommendation the Board has weighed the cost against the commercial benefits. The Board suggests that the district officer be directed to prepare a final estimate of the cost of producing and maintaining a 21-foot channel through Horn Island Pass from the 21-foot anchorage area to deeper water in the Gulf.

For the Board:

A. M. MILLER,
Lieut. Col., Corps of Engineers,
Senior Member Present.

[Eighth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 21, 1903.

Respectfully returned to Captain Craighill with request that he prepare and submit (through the division engineer) an estimate for a 21-foot channel as suggested by the Board of Engineers for Rivers and Harbors in the preceding indorsement, together with any further remarks and recommendations that he may deem proper.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Tenth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 31, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors with estimate for 21-foot channel as recommended.

By command of Brig. Gen. Gillespie.

H. F. HODGES,
Major, Corps of Engineers.

[Eleventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 5, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given consideration to the accompanying estimate of the district officer, dated December 26, 1903, for a channel 21 feet deep through Horn Island Pass, requested in seventh indorsement hereon.

In his report, dated November 7, 1903, on the survey of Horn Island Pass, the district officer submits a project and estimate of cost. He proposes to dredge—

> an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island; a connecting channel between the anchorage basin and the throat of the Pass, also 24 feet deep and 200 feet wide, and a 25-foot channel, 300 feet wide across the outer bar.

The estimated amount to be removed, after adding 60 per cent for bin measure and maintenance during execution of the work, is 1,600,000 cubic yards. The estimated cost of the work is—

Dredge (one-half cost)	$55,000
1,600,000 cubic yards, bin measure, dredging, at 9 cents	144,000
Stopping lateral channel at end of Horn Island, and contingencies	26,000
Total	225,000
The district officer's estimate for the work suggested by the Board, a channel 21 feet deep through the pass, is 368,000 cubic yards, scow measure, at 35 cents	128,800
Contingencies	17,200
Total	146,000

The Board does not understand the difference in unit prices employed by the district officer in the two estimates. For example, an estimate might be stated for the work recommended by the Board, in form similar to the original estimate, as follows:

Dredge (one-half cost)	$55,000
368,000 cubic yards, at 9 cents	33,120
Contingencies	9,880
Total	98,000

And in this case there would remain to be credited to the work after its execution one-half the cost of the dredge. The Board, however, recognizes the difficulty of estimating the cost of bar dredging by contract, in view of the lack of plant in private hands available for such work.

It is recommended that these papers be sent back to the district officer with request for information on this subject, and that they be returned through the division engineer.

For the Board:

A. M. MILLER,
Lieut. Col., Corps of Engineers,
Senior Member Present.

[Twelfth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, January 8, 1904.

Respectfully returned to Captain Craighill, with request that the further information called for by the Board of Engineers for Rivers and Harbors in eleventh indorsement hereon be furnished, with return of the papers through the division engineer.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Thirteenth indorsement.]

ENGINEER OFFICE, U. S. ARMY,
Mobile, Ala., January 19, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

On account of the small amount of work to be done to get a channel 21 feet deep, I made my estimate on the assumption that the first appropriation for this improvement would not be large enough to pay for even half of a dredge, and, in addition, to operate it for the time necessary to do the work. Under this supposition it would be necessary to let the work by contract. This has been the experience with Mobile bar. The first estimate for the 25-foot channel is based on the supposition that the first appropriation would be large enough to build a dredge in connection with the improvement of Mobile Harbor and other sea bars in my district.

It would be safer and perhaps fairer for the purposes of comparison to estimate the 25-foot channel also at 35 cents per cubic yard, with the reservation that a suitable dredge belonging to the Mobile district and available for work at any point within it would very greatly reduce the cost of this and all similar improvements pertaining to this office.

W. E. CRAIGHILL,
Captain, Corps of Engineers.

(Through the Division Engineer.)

[Fourteenth indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., January 21, 1904.

Respectfully forwarded to the Chief of Engineers, United States Army.

The river and harbor act approved June 13, 1902, requires a preliminary examination or survey to be made of "Horn Island Pass, with a view to a channel of twenty-five feet depth and suitable width." As stated in my indorsement of November 21, 1903, in my opinion the commercial interests, present and prospective, involved, do not justify the Government in incurring the expense of forming and maintaining a channel 25 feet deep through Horn Island Pass. I see no reason for changing the opinion thus expressed.

It appears that Captain Craighill has furnished the information called for by the Board of Engineers for Rivers and Harbors and by the Chief of Engineers.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Fifteenth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, January 27, 1904.

Respectfully returned to the Board of Engineers for Rivers and Harbors, inviting attention to thirteenth and fourteenth indorsements hereon.

By command of Brig. Gen. Mackenzie:

H. F. Hodges,
Major, Corps of Engineers.

[Sixteenth indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., January 30, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

It appears that to deepen the channel of entrance to Horn Island Harbor to 21 feet, if very large allowance be made for deterioration of work during its execution, the removal of 368,000 cubic yards of material will be necessary. If a Government dredge were available to do this work, the total cost would not exceed 11 cents per cubic yard, or $40,480, and this amount will include all expenses of operation, maintenance, and deterioration of plant, insurance, interest, etc.

In view of the fact that almost no plant fit for bar dredging exists in private hands in this section of the country, it would cost perhaps 35 cents per cubic yard, or $146,000, including administration and contingencies, to execute the work by contract.

Several United States dredges are approaching completion for work upon the South Atlantic and Gulf coasts. It is believed that from among some of the Government dredges now built or building one can, at some opportune time, be spared from the work for which it is particularly designed, to do the work at Horn Island Pass. This work would not require more than from four to six months' time. Under existing law the Secretary of War is authorized to transfer plant temporarily from one work to another under certain conditions.

The conclusions of the Board may be summed up as follows:

(*a*) The commerce, present and prospective, at Horn Island Harbor does not justify the excavation of a 25-foot channel at Horn Island Pass. Any increase of depth exceeding 21 feet would be of no value unless the interior anchorage basin were also deepened, and the cost of the 25-foot channel with suitable anchorage basin is estimated at about $218,000.

(*b*) The work recommended by the district officer to prevent a break in Horn Island is not considered necessary at this time.

(*c*) The excavation of a channel at Horn Island Pass 21 feet deep, 300 feet wide across the outer bar, and 200 feet wide elsewhere, connecting the natural anchorage with the deeper water of the Gulf, in view of resulting commercial benefits, is advisable if, to dredge the 368,000 cubic yards which must be removed, a unit price of 11 cents per cubic yard can be assumed, having in view the execution of the work by means of Government plant temporarily loaned from some other harbor.

(*d*) If it is impracticable to count upon the use of Government plant, the 21-foot channel above mentioned, estimated at 35 cents per cubic yard, would cost $146,000, including administration and contingencies. It is believed that the expenditure of this sum would not be justified by resulting benefits.

(*e*) The cost of maintenance of the channel under consideration, if a Government dredge were available for work for a period not to exceed one month in each year, would not exceed $9,000 annually.

In the belief that this work can be done with a Government dredge in the manner outlined above, the Board believes that an estimate of 11 cents per cubic yard may be adopted, and is of opinion that it is advisable to provide through Horn Island Pass a channel 21 feet deep, as above indicated, at a cost of $40,480, with $9,000 annually for maintenance.

For the Board:

R. L. HOXIE,
Major, Corps of Engineers,
Senior Member Present.

SURVEY OF HORN ISLAND PASS, MISSISSIPPI.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., November 7, 1903.

GENERAL: In accordance with instructions in Department letter dated August 1, 1903, I have the honor to report the completion of the survey of Horn Island Pass, Mississippi, and to inclose herewith the report of my assistant, who had local charge of the survey, with a map[a] showing the present condition of the pass. A careful study has been made of conditions at this locality, as far as I have been able to ascertain them, from the records of this office and from data kindly furnished by the Coast and Geodetic Survey.

The estimate includes an anchorage basin 600 feet wide by 3,000 feet long and 24 feet deep behind Horn Island, a connecting channel between the anchorage basin and the throat of the pass; also 24 feet deep and 200 feet wide, and a 25-foot channel 300 feet wide across the outer bar. The estimated amount to be removed, measured in place, is 1,000,000 cubic yards. It is almost impossible to predict, in the absence of much experience at this point, the percentage which must be allowed for filling in after the dredging. For the purpose of the estimate, I have assumed that 60 per cent excess will cover the difference between place and bin measurements in addition to the filling due to the drift of the sand across the channel. The total estimate of the cost of the work is $225,000, with an annual cost for maintenance after completion of $20,000. The cost of maintenance would probably be less provided a dredge were available for use at this point and on Mobile bar, dividing the annual expense between the two.

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[a] Not printed.

The only business of any consequence using this pass is the exportation of lumber and timber to South American, European, and Atlantic coast ports. During the past two years this has amounted to $1,644,774. It is estimated that the supply of timber will last from twenty-five to thirty years at the present rate of cutting. Much of the lumber and timber that would go out of Horn Island Pass if improved to a sufficient depth is now taken to Ship Island anchorage and loaded there, passing out to sea through Ship Island Pass. The shippers interested in this business estimate that the extra cost to them each year of using Ship Island Pass instead of Horn Island Pass is about $55,000, based on the present annual rate of shipment. These shipments would probably be increased by the improvement of Horn Island Pass.

There has heretofore been considerable doubt as to the stability of any improvement to Horn Island Pass, but the records of recent years indicate that the pass has reached a condition of comparative stability, and that with the use of a dredge owned by the Government and always available the channel can be maintained in approximately its present position. This will involve some work on the end of Horn Island to prevent a breach at that point during heavy gales, and provision for this work has been made in the estimate.

On account of the saving to the business interests of Scranton and Pascagoula, Miss., for which the proposed improvement will provide the shortest route to sea, I am of the opinion that the pass is worthy of improvement by the General Government.

Respectfully submitted.

W. E. Craighill,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., November 21, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army.

It appears from the within report of Captain Craighill that to obtain a channel 25 feet deep and of suitable width through Horn Island Pass, Mississippi, and to provide an anchorage basin 24 feet deep behind Horn Island, would cost $225,000, with an annual cost for maintenance after completion of $20,000; and that the estimated saving to the local lumber interests of Scranton, Mosspoint, and Pascagoula, Miss., would be about $55,000 per annum. It also appears that the proposed improved channel will be used mainly by these lumber interests and that the present supply of timber will be exhausted at the end of twenty-five or thirty years.

From the history of this locality it is believed that the maintenance of a 25-foot channel through the outer bar, when obtained, would be a difficult, uncertain, and expensive matter. In view of the large cost of the improvement contemplated as compared with the probable benefit to commerce, and the fact that if such a channel is dredged by the Government the benefit will be mainly local, I am unable to concur in the opinion of the district engineer that this locality is worthy of improvement by the General Government to the extent indicated. In my opinion the commercial interests, present and prospective, involved do not justify the Government in incurring the expense of forming and maintaining a channel 25 feet deep through Horn Island Pass.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

REPORT OF MR. DAVID G. ANDERSON, ASSISTANT ENGINEER.

Engineer Office, United States Army,
Mobile, Ala., November 4, 1903.

Captain: I have the honor to submit the following report upon a survey of Horn Island Pass, Mississippi, made in accordance with your instructions, in order to determine the feasibility, probable cost, and desirability of improving the channel of entrance through this pass from the Gulf of Mexico to Mississippi Sound.

Work on this survey was commenced on August 18, 1903, and was continued at intervals, when weather conditions permitted, until October 6, 1903, at which time the field work of the survey was completed. The plotting of the notes was commenced on September 16, 1903, the latter work, together with a study of the locality, the compilation of estimates, and the preparation of the final map, having been in progress until the present time. The purpose of the survey was to furnish a complete development of the channel through the pass, together with the hydrography of Horn Island anchorage, as well as an examination of the lateral channel extending behind Petit Bois Island. The survey included quite an extent of Horn Island anchorage to the west of Horn Island light, but, owing to the fact that the more remote portions of this anchorage would prove entirely too expensive to improve, this section of the survey has not been included in the map nor considered in the scheme for improvement.

In 1902 the adopted plane of reference in the Pascagoula River, Mississippi, which is just north of Horn Island Pass, was lowered 1 foot in order to coincide more closely with the elevation of mean low water. A corresponding adjustment of the plane of reference heretofore used at Horn Island was also found to be necessary as a result of simultaneous tidal observations at the mouth of the Pascagoula River and at Horn Island and has been introduced in the present survey. The depths of 19 or 19½ feet, referred to in the report upon the preliminary examination, will therefore become 18 or 18½ feet when referred to the new datum.

A description of the geographical location and environment of Horn Island Pass, as well as the arguments presented by the navigation interests in favor of its improvement, is set forth in the report upon the preliminary examination of this locality.

Horn Island anchorage is a narrow pocket of deep water stretching along the north side of Horn Island for a distance of about 8 miles. The anchorage basin is connected with the Gulf of Mexico by a navigable channel through Horn Island Pass. The outlet channel from the anchorage extends eastward from the eastern end of Horn Island a distance of nearly a mile, and then deflecting abruptly to the southward it passes between the ends of Horn and Petit Bois islands, and after crossing the plateau of sand which has been deposited around the pass entrance, finally reaches deep water in the Gulf of Mexico.

The depths in the western portions of the Horn Island anchorage not shown on the map vary from 19 to 21 feet, with small pockets here and there having depths up to 25 feet. Just to the northwest of Horn Island light there is a pocket about 3,000 feet long with depths greater than 22 feet, while from the latter locality to the deep water of the pass opening a channel with depths of from about 20 to 25 feet exists. In the throat of the pass, soundings of from 25 to 31 feet are obtained until a point about 4,000 feet south of a line joining the ends of Horn Island and Petit Bois Island is reached, where the sea bar commences. As is customary on sea bars of the Gulf coast, the harbor slope is very gentle, the crest is at its extreme outer end, and the sea slope is very steep. The soundings on the sea slope increase from 18 feet on the crest to 28 feet in the short distance of 100 feet.

The present survey of Horn Island Pass has been compared with the Coast Survey charts of 1853 and 1886, and with the Engineer Department survey of 1896, in order to determine what changes have been, and are now, in progress in this locality, and to ascertain the probable effect of these changes upon the improvement proposed. From this comparison the following facts have been deduced:

(1) The width of Horn Island Pass decreased from 18,450 feet in 1853 to 8,540 feet in 1886. Since the latter date the width has shown a tendency to remain constant.

(2) The depths over the outer bar of the pass increased from 14 or 15 feet in 1853 to 18 or 18½ feet in 1886. Since the latter date the depth has remained practically constant.

(3) The position of the sharp bend in the channel between Horn Island anchorage and the Gulf of Mexico has remained almost stationary, and while Horn Island has receded from this point, Petit Bois Island has advanced toward it, the growth of the latter being more rapid than the recession of the former.

(4) The changes which have taken place in the position of the entrance channel have been confined to that portion of its extent over the sea bar to the south of the bend mentioned in the preceding paragraph. The resultant movement has been to the westward, and, while in 1853, the crest of the thalweg over the outer bar was to the east of a north and south line through the bend, at the present time it is to the west of such a line. The point where the thalweg crosses the outer bar has advanced during the past fifty years a distance of perhaps 3,750 feet in a southwesterly direction.

The following table shows some of the physical changes which have occurred since 1853:

Date of survey.	Width of cross section.	Maximum depth.	Mean depth.	Area of cross section.
	Feet.	*Feet.*	*Feet.*	*Square feet.*
1853	18,450	25	8.8	163,400
1886	8,540	28	15.2	129,700
1903	8,468	31	15.5	130,900

The dredging which was performed on the outer bar in 1897 to a depth of 20 feet at low water (19 feet referred to the present datum) has been obliterated by shoaling, but the work apparently has had the effect of retarding the westerly movement of the thalweg.

Prior to 1888 Horn Island extended close to the sharp bend in the entrance channel. In August of that year, however, a heavy gale washed away about one-half mile of the end of the island, and since that time the depths across the former site of the island have been gradually increasing. At the present time the currents flowing around the end of Horn Island have caused a breach in the shoal marking the former site of the island, and a lateral channel with over 18 feet of water in it is now advancing seaward close to the island's end.

From an examination of the shores of Horn Island it is apparent that the island is cutting away on the south side and building up on the northern. The island generally at its eastern end is narrower than formerly, and as this portion of its extent is a low, flat sand beach, devoid of vegetation and exposed to the full force of the southerly or southeasterly gales, a repetition of the breaching of 1888 is not impossible. Such a breaching, if extensive, would probably affect considerably the location of the pass channel, owing to the diminished effects of the ebb current over the site of the present channel.

Horn Island Pass is now made use of in winter time by vessels up to a draft of 19 feet, while with the higher tides of summer time a draft of 20 feet is possible at times. During the past two fiscal years, July 1, 1901, to June 30, 1903, the pass has been made use of by 400 outward-bound vessels, with cargoes, of the following drafts:

Below 10 feet	34
10 to 11 feet	66
11 to 12 feet	28
12 to 13 feet	39
13 to 14 feet	108
14 to 15 feet	39
15 to 16 feet	18
16 to 17 feet	19
17 to 18 feet	8
18 to 19 feet	17
19 to 20 feet	20
20 feet or over	4
Total	400

The maximum draft which has recently been carried through the pass was 20.2 feet, by the steamer *Heathfield*, in the summer of 1902. The preponderance of vessels of about 13 feet in draft is due to the fact that this is the maximum draft that can now be carried to the sawmills on the Pascagoula River, and therefore the maximum draft that can be loaded with a single handling of cargo. The 400 vessels enumerated above carried 129,611,000 feet B. M. of Mississippi pine timber, valued at $1,644,774.

As stated in the report upon the preliminary examination of Horn Island Pass, the anchorage basin is not deep enough to make the improvement of the pass channel of benefit unless some work is done in the basin also. The most sheltered site for loading vessels at Horn Island is toward the middle of the island, but as the channel leading to this point is comparatively shallow and narrow it is not believed that the work involved would be warranted. On this account the more accessible, though less shelted, point immediately to the northwest of Horn Island light is recommended for the site of the deep-water anchorage. An area 600 feet by 3,000 feet is proposed for this basin, with a depth of 24 feet, and in the area selected deep-draft vessels can be loaded without interfering with the passage of lighter-draft vessels to other parts of the anchorage. Between the basin and the throat of the pass a 24-foot channel, 200 feet wide, is proposed, while after widening portions of the existing deep-water pockets, removing lumps, and dredging the middle ground shoal, a 25-foot channel, 300 feet wide, across the outer bar has been estimated upon. The performance of this work will require the removal of about 1,000,000 cubic yards of material in place, or, perhaps, 1,600,000 cubic yards, bin measurement, a large coefficient being adopted to allow for shoaling during the progress of the work and for the inflow of littoral drift on the outer bar.

Two borings were made at the localities marked 1 and 2 on the map. The first of these showed a mixture of mud and sand, while the latter showed sand alone.

The performance of this amount of work will only be warranted if its execution can be accomplished at a low figure. The greatest economy in its performance can be effected by the use of a Government seagoing dredge, and this is apparently the only method by which it is practicable to undertake this improvement. A seagoing dredge is urgently needed elsewhere in this district, and it is therefore believed that the construction of such a machine would permit of the economical performance of the Horn Island work and at the same time result in an improvement of navigation facilities elsewhere in the district.

The improvement of Horn Island Pass by any other means than dredging is considered impracticable. Owing to the fact that the crest of the sea bar is 7,000 feet away from a line joining the ends of Horn and Petit Bois islands, the construction of jetties would prove very expensive, while in addition the unstable nature of these islands would make such a scheme of improvement very uncertain. An alternative scheme of dredging an entirely new outlet from Horn Island anchorage to a point toward the center of the island has been suggested. At this locality the sea slope of the island is quite steep and the distance across the island between deep water inside and outside is comparatively short. Owing to the heavy cutting that would be necessary, however, the yardage to be removed would be fully as great as by utilizing the present pass, while the results of such a plan would be decidedly problematic.

The estimated cost of the Horn Island dredging following the pass channel, on the basis of a Government dredge, one-half the cost of which is supposed to be charged to other works in this district, is as follows:

Dredge (one-half cost)	$55,000
1,600,000 cubic yards of dredging (in bins), at 9 cents	144,000
Stopping lateral channel at end of Horn Island, engineering, etc	26,000
Total	225,000

Owing to the changes in progress at Horn Island the lines of dredging are laid down on the map subject to revision prior to the undertaking of the work, should this improvement be provided for. During the survey current floats were attempted, to furnish information as to the best location for the dredged cuts; but owing to unfavorable conditions the results were not entirely satisfactory, except in showing the danger to be apprehended from the channel working out past the end of Horn Island.

The channel which was dredged in the anchorage basin in 1900 and 1901 has maintained itself very well, and it would therefore seem that the proposed basin and the inner end of the proposed channel will require but small future expenditures for maintenance. It is believed, too, that regulations could be established by the harbor master at Horn Island under which the ballast unloaded from incoming steamers could be disposed of in such a way as to assist in the maintenance of this portion of the project.

The channel across the outer bar, however, is exposed to the action of adverse forces and will undoubtedly need attention from time to time. The cost of maintaining this improvement after its completion is estimated at about $20,000 annually.

The exports from Horn Island Harbor, as heretofore shown, consist entirely of lumber and timber, and as no other business will probably ever make any extensive use of the improved channel, inquiries have been made as to the probable life of the timber business in this part of the United States. Conservative mill men state that the timber lands tributary to the Pascagoula River are extensive enough to permit of an undiminished output for twenty-five or thirty years to come. Under these circumstances the improvement of Horn Island Pass by the General Government seems warranted, particularly in view of the fact that the interests involved have been considered important enough to warrant the adoption of the present project for the improvement of the Pascagoula River.

Respectfully submitted.

David G. Anderson,
Assistant Engineer.

Capt. W. E. Craighill,
Corps of Engineers, U. S. Army.

SUPPLEMENTARY REPORT ON SURVEY.

Engineer Office, United States Army,
Mobile, Ala., December 26, 1903.

General: In compliance with directions conveyed in Department indorsement dated December 21, 1903, on my report of the preliminary examination of Horn Island Pass, dated June 9, 1903, I have the honor to report that the estimated cost of a 21-foot channel through Horn Island Pass, on the lines laid down in my report of the survey of Horn Island Pass, dated November 7, 1903, is $146,000.

The cross-section measurement of the yardage is 230,000 cubic yards, allowing 1.5 feet for overdepth in dredging. It is difficult, in the absence of experience at the locality, to estimate the amount to be added for the drift of the sand across the channel during dredging. On account of this uncertainty, I have estimated the scow measurement at 60 per cent greater than place measurement. On account of the small amount of work it will probably be necessary to do this dredging by contract. Prices paid for similar work in the past have been as follows:

At Horn Island Pass, 1897–98, 40 cents per cubic yard.
At Horn Island anchorage, 1900–1901, 34 cents per cubic yard.
At outer bar of Mobile Harbor, 1903, 30 cents per cubic yard.
At Ship Island Pass, 1900, 22½ cents per cubic yard.

Based on this experience, I have estimated the price per cubic yard at 35 cents. In detail the estimate would then be as follows:

368,000 cubic yards, measured in the scows, at 35 cents per cubic yard	$128,800
Contingencies	17,200
Total	146,000

Respectfully submitted.

W. E. CRAIGHILL,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

APPENDIX S.

IMPROVEMENT OF THE PASSES OF THE MISSISSIPPI RIVER, OF BAYOU LAFOURCHE, OF BAYOU PLAQUEMINE, GRAND RIVER, AND PIGEON BAYOUS, AND OF BAYOU TECHE, LOUISIANA.

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Closing crevasse in Pass a Loutre, Mississippi River.
2. Outlet of Mississippi River.
3. Southwest Pass of the Mississippi River.
4. Examinations and surveys at South Pass, Mississippi River.
5. Maintenance of South Pass channel, Mississippi River.
6. Bayou Lafourche, Louisiana.
7. Bayou Plaquemine, Grand River, and Pigeon Bayous, Louisiana.
8. Bayou Teche.

United States Engineer Office,
New Orleans, La., July 11, 1904.

General: I have the honor to submit herewith annual reports upon works of river and harbor improvement for this district for the fiscal year ended June 30, 1904.

Very respectfully, your obedient servant,

H. M. Adams,
Lieut. Col., Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

S 1.

CLOSING CREVASSE IN PASS A LOUTRE, MISSISSIPPI RIVER.

For details of the progress and completion of this work, see page 1487, Annual Report of the Chief of Engineers for 1898, and page 1839 of report for 1899.

During the past fiscal year the only change in the condition of the dam which was built to close Pass a Loutre crevasse was the washing away of 2 feet of the sheet piling at the extreme east end of the dam.

The condition of the dam at the end of the year was as follows: From range No. 2, the extreme east end of the dam (see chart accompanying), to 20 feet from the same point, the dam has gone out; from 20 feet to 738 feet, the dam is in good condition; from 738 feet to 885 feet, the work is effective, although badly out of line and weak; from 885 feet to 1,819½ feet, all the work is gone; from 1,819½ feet to "Y" and from "Y" to "D" the work is in good condition.

A survey of Pass a Loutre crevasse and vicinity was made in May, 1904, a chart showing the results of which is forwarded herewith.

Money statement.

July 1, 1903, balance unexpended	$21,004.92
July 1, 1904, balance unexpended	21,004.92

ABSTRACT OF APPROPRIATIONS.

By act of Congress approved February 26, 1897	[a] $250,000

S 2.

IMPROVEMENT OF THE OUTLET OF THE MISSISSIPPI RIVER.

A history of the progress of the work will be found in Annual Report of the Chief of Engineers for 1901, page 1878; see also, Annual Report for 1902, page 1323.

During the past fiscal year no work has been done or expenditures made under the direction of the New Orleans, La., office.

Money statement.

July 1, 1903, balance unexpended, in hand under the New Orleans, La., office	$456.44
July 1, 1904, balance unexpended, in hand under the New Orleans, La., office	456.44

ABSTRACT OF APPROPRIATIONS.

By act of Congress approved March 3, 1899	$200,000
By sundry civil act approved June 6, 1900	300,000
Total	500,000

S 3.

IMPROVEMENT OF THE SOUTHWEST PASS OF THE MISSISSIPPI RIVER.

All of the land below or south of Pilot Town, on the east bank, and all that below the United States reservation, on the west bank of Southwest Pass, containing about 1,275 acres, was acquired for use in connection with the work, payment being made on July 10, 1903.

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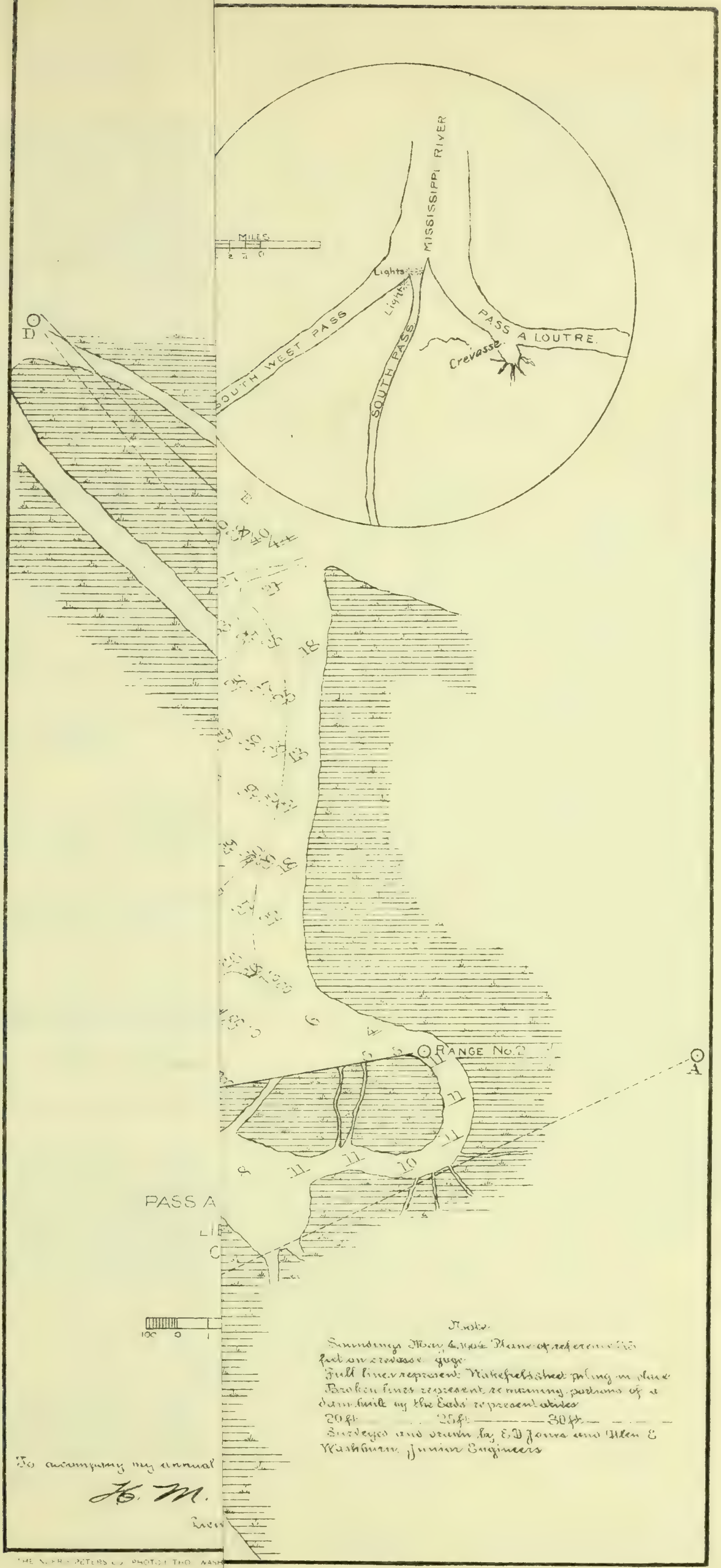
[a] Of this amount $10,000 was allotted by act of February 17, 1898, for survey of Southwest Pass, Mississippi River.



Notes.

Soundings May 4, 1904. Plane of reference [illegible] feet on crevasse gage.

Full lines represent Wakefield sheet piling in place.

Broken lines represent remaining portions of a dam built by the Eads' representatives

20 ft. ...... 25 ft. ———— 30 ft. — — · — —

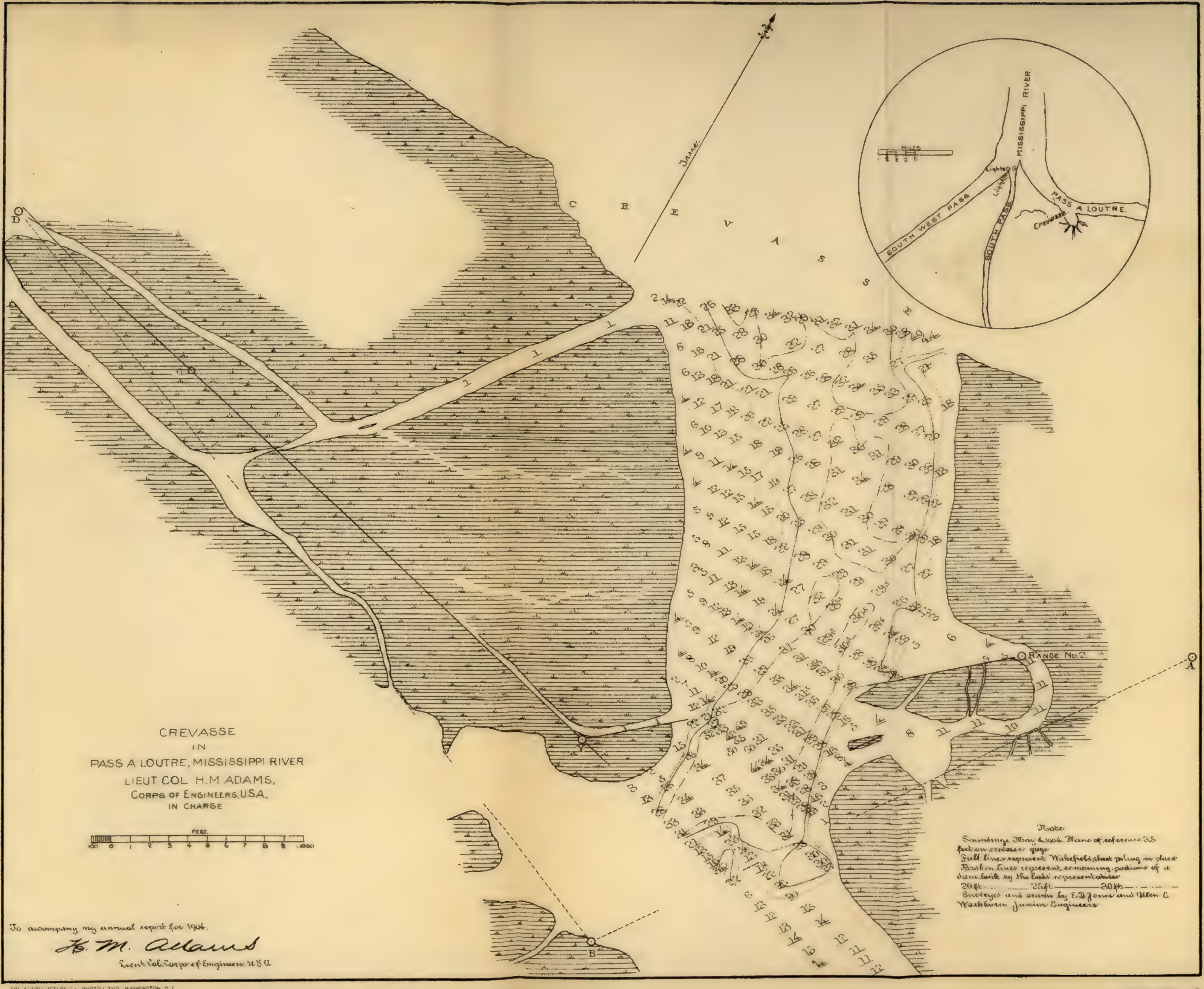
Surveyed and drawn by E. D. Jones and Allen E. Washburn, Junior Engineers

To accompany my annual

H. M.

Lieu

THE NORRIS PETERS CO. PHOTO-LITHO. WASH



CREVASSE
IN
PASS A LOUTRE, MISSISSIPPI RIVER
LIEUT COL H. M. ADAMS,
CORPS OF ENGINEERS, U.S.A.
IN CHARGE

Note.
Soundings May 6, 1904. Plane of reference 3.5 feet on crevasse gage
Full lines represent Wakefield sheet piling in place.
Broken lines represent remaining portions of a dam built by the Eads' representatives
20 ft. .... 25 ft. ———— 30 ft. —·—·—
Surveyed and drawn by E. D. Jones and Allen E. Washburn, Junior Engineers

To accompany my annual report for 1904.

H. M. Adams
Lieut. Col. Corps of Engineers, U.S.A.

THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON D.C.

Contract was entered into on July 16, approved July 31, 1903, with Christie & Lowe, Chicago, Ill., for construction of two jetties of willow mattresses, stone, and concrete. The method of construction of the mats and concrete capping and the location of the jetties are shown on the accompanying maps.

The contractors began the assembling of plant and materials at the site of the jetties in September, 1903. Twenty-two buildings for offices, warehouses, quarters, etc., and two wharves were constructed on piles at a distance of about 3,500 feet from the beginning or shore end of the east jetty, and a tramway built from the wharves extending out along the site of the east jetty for a distance of about 6,200 feet. A tramway was also commenced along the site of the west jetty, and to June 30 had been extended for a distance of 3,600 feet from the shore end.

The construction of mats in place in the east jetty was commenced December 31, 1903. To the end of the fiscal year, the foundation mats had been laid in the east jetty for a distance of 12,600 feet from the shore end, a total of 63 mats, each 200 by 100 feet, having been placed. Mats Nos. 1 to 28, inclusive, were built in place in the jetty and secured by 40 pounds of stone per square foot. Mats Nos. 29 to 63, inclusive, were built on mat ways, floated to position in the jetty, sunk, and secured in place by 50 pounds of stone per square foot of mattress.

Attention is invited to the accompanying report of Mr. C. Donovan, assistant engineer.

Money statement.

July 1, 1903, balance unexpended		$1,749,791.12
July 11, 1903, amount deposited to credit of appropriation		142.50
		1,749,933.62
June 30, 1904, amount expended during fiscal year	$178,534.86	
Amount drawn on account of construction of dredge to January 1, 1904	153,845.61	
		332,380.47
July 1, 1904, balance unexpended		1,417,553.15
July 1, 1904, outstanding liabilities		85,257.30
July 1, 1904, balance available		1,332,295.85
July 1, 1904, amount covered by uncompleted contracts		1,926,280.49

Amount (estimated) required for completion of existing project	4,250,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	1,250,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—

Approved June 13, 1902	$750,000
Approved March 3, 1903	1,000,000
Total	1,750,000

ABSTRACT OF CONTRACTS IN FORCE DURING FISCAL YEAR ENDING JUNE 30, 1904.

Name and address of contractor: Christie & Lowe, Chicago, Ill.
Work: Constructing two jetties of willow mattresses, stone and concrete, at Southwest Pass, Louisiana.
Contract prices: Brush mattress, 96 cents per square yard; riprap stone, $4 per ton; concrete, $6.10 per cubic yard. Total estimated amount of contract, $2,175,896.60.
Dated: July 16, 1903.
Approved: July 31, 1903.
Date of expiration: August 3, 1907.

Name and address of contractor: The Johnson Iron Works (Limited), New Orleans, La.
Work: Furnishing and installing water-tube boiler in U. S. boat *Chere Amie.*
Contract price: $2,575.
Dated: September 23, 1903.
Date of completion: December 11, 1903.
Emergency contract; two-thirds of cost paid from appropriation for improving Southwest Pass, Mississippi River, and one-third from appropriation for maintenance of South Pass Channel, Mississippi River, 1904.

COMMERCIAL STATISTICS.

For commercial statistics for the port of New Orleans, see report on "Maintenance of South Pass Channel, Mississippi River."

REPORT OF MR. C. DONOVAN, ASSISTANT ENGINEER.

New Orleans, La., *July 5, 1904.*

Sir: I have to report upon the improvement of the Southwest Pass of the Mississippi River during the fiscal year ending June 30, 1904.

On July 31, 1903, a contract with Christie & Lowe, of Chicago, Ill., was approved by the Secretary of War for the construction of two jetties, the east one to be about 4 miles long, and the west one 3 miles, to be constructed of brush mattresses weighted with stone and concrete.

About September 10, 1903, the contractors began to assemble plant and materials, and to construct wharves and permanent quarters on the east bank of the Pass, opposite Southwest Pass light-house.

THE PLANT.

The contractors' permanent plant consists of 650 feet of floored wharf, 200 feet of wharf without flooring, and 22 buildings of different sizes for quarters, offices, storehouses, shops, etc.

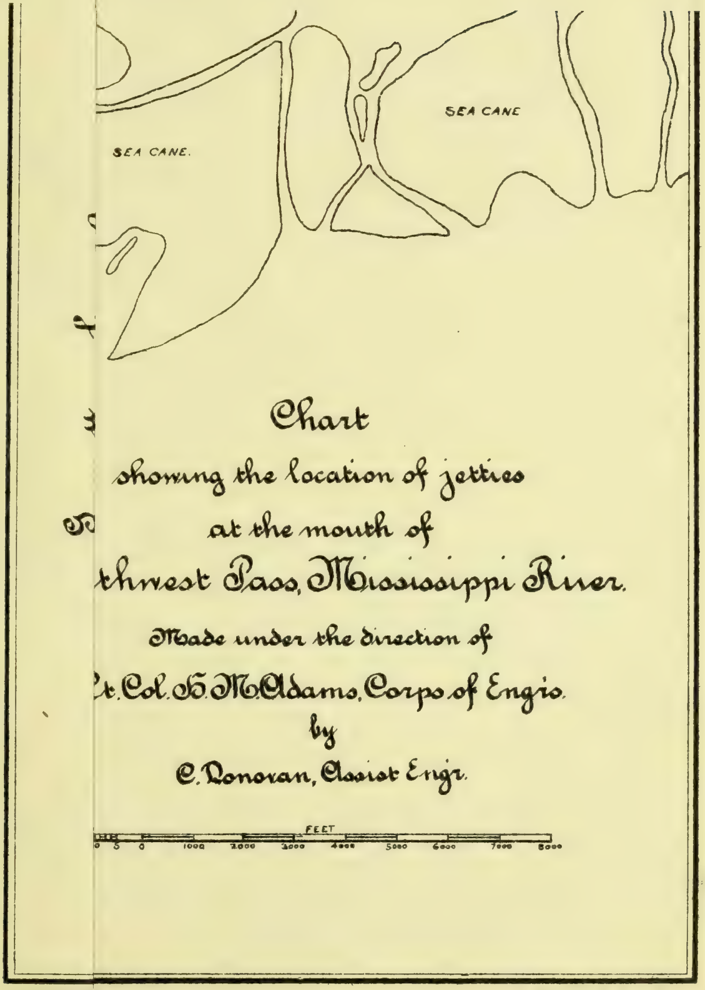
Sixteen thousand two hundred feet of narrow gauge railroad was built on a tramway consisting of two-pile bents 15 feet apart, with caps, stringers, ties, and rails, from the wharves to the site of the east jetty, for the purpose of transferring materials for building mattresses in place in the east jetty where the water was too shoal to float them. Six thousand four hundred feet of the tramway is double track, one on each side of the center line of the jetty.

The floors of buildings and top of tracks are 8 feet above mean high water.

The equipment for the railroad consists of 2 locomotive engines of 8 tons each, and 40 cars 9⅔ by 5⅔ feet, having a carrying capacity of 5 tons.

The floating plant consists of 3 tugs, 1 stern-wheel steamer, 1 yacht, 2 launches, 1 quarter boat, 2 derricks, and 2 pile drivers.

At their quarry, 1½ miles from Berry, Ala., from which their supply of stone is obtained, the contractors have 2,000 feet of side track, 4 engines, 4 derricks, 10 drills, 2 boilers, 2 drainage pumps, and 25 buildings as quarters for laborers.

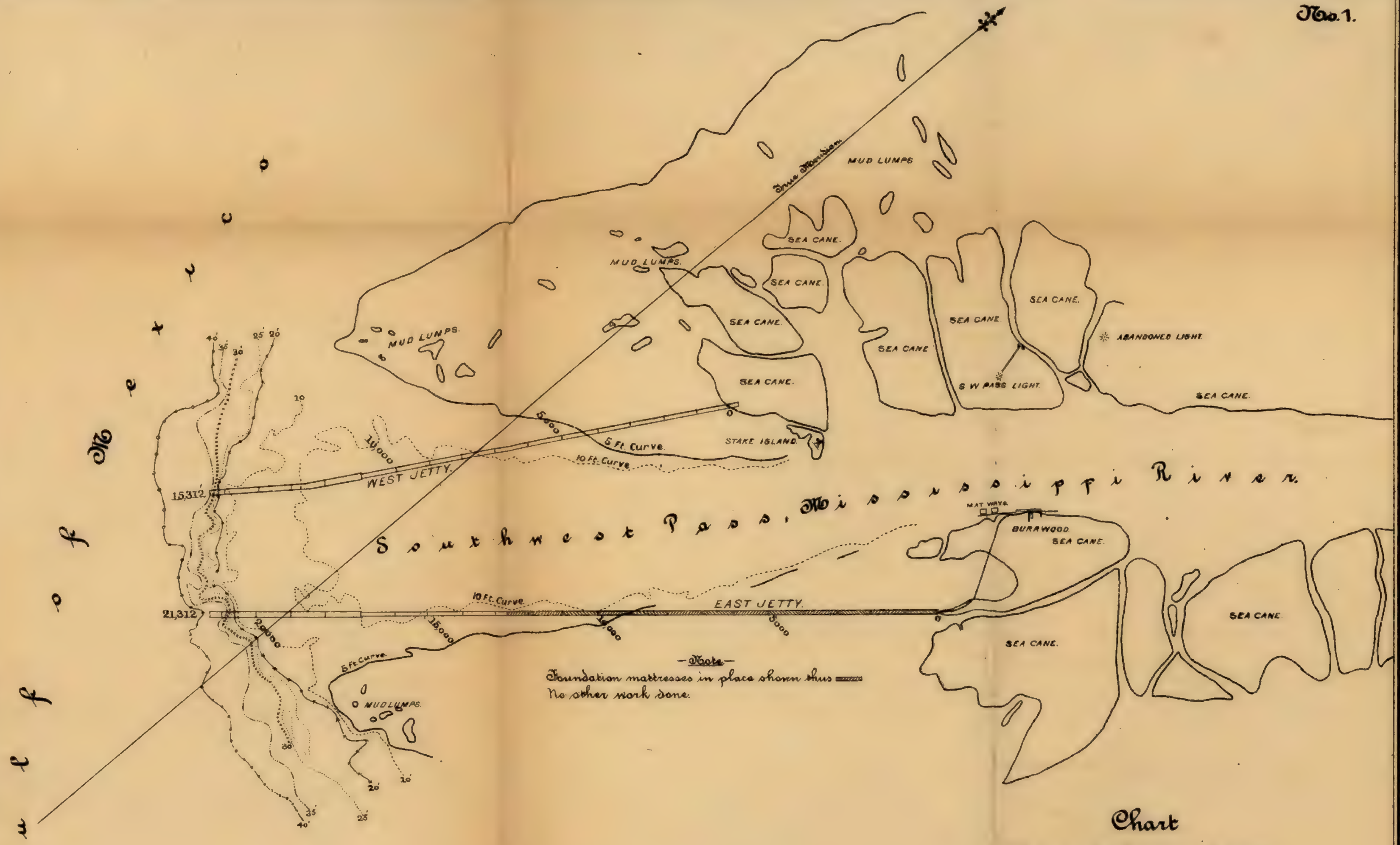


Chart

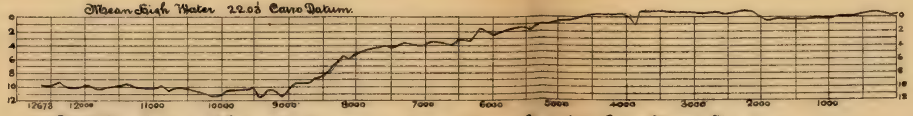
showing the location of jetties
at the mouth of
thwest Pass, Mississippi River.
Made under the direction of
Lt. Col. H. M. Adams, Corps of Engrs.
by
C. Donovan, Assist Engr.

THE NORRIS PE

No. 1.



-Note-
Foundation mattresses in place shown thus ▨
No other work done.



Profile of top of foundation mattresses in place in East Jetty, June 30, 1904.

Chart
showing the location of jetties at the mouth of
Southwest Pass, Mississippi River.

Made under the direction of
Lt. Col. H. M. Adams, Corps of Engrs.
by
C. Donovan, Assist Engr.

FEET
1000 0 1000 2000 3000 4000 5000 6000 7000 8000

To accompany my report for the year ending June 30, 1904.

H. M. Adams

Lt. Col. Corps of Engineers, U.S.A.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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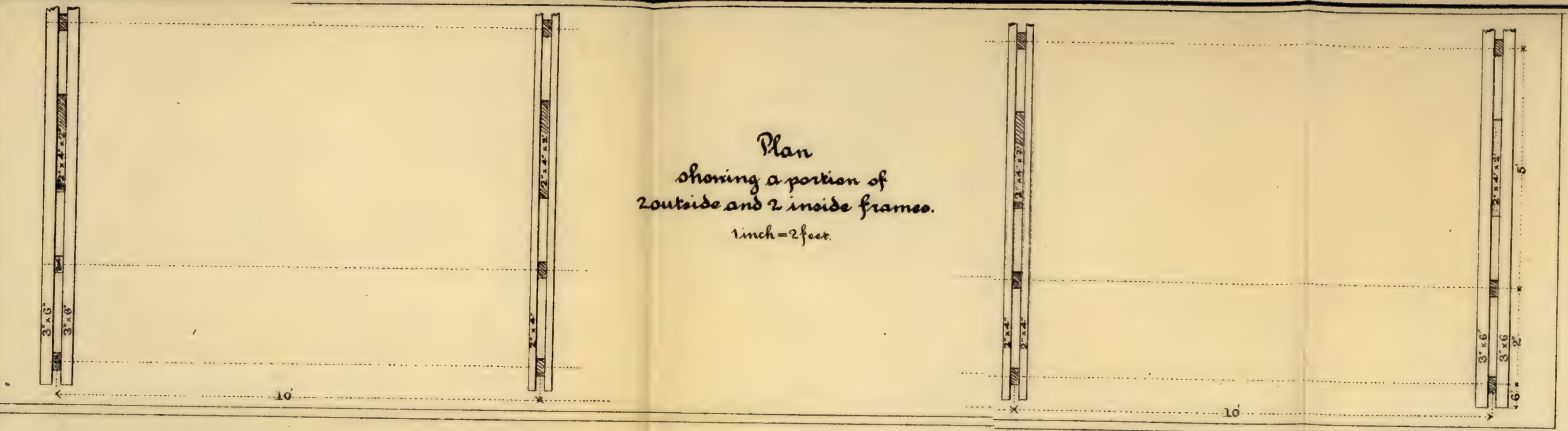
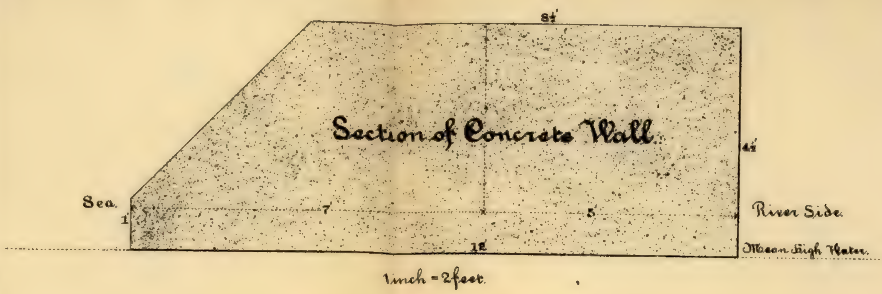
Engis.

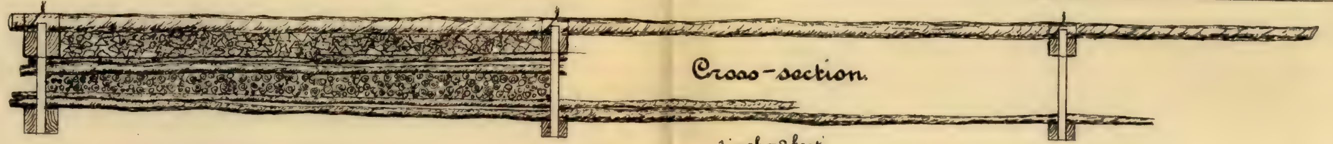
No. 2.



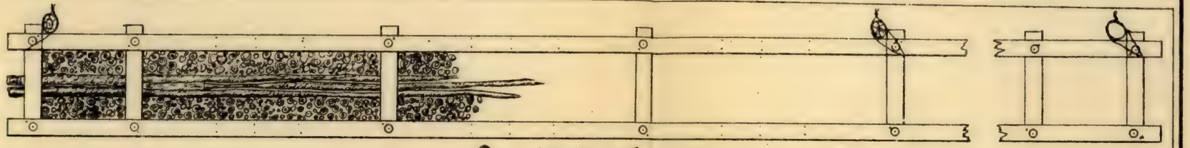
Plan
showing a portion of
2 outside and 2 inside frames.
1 inch = 2 feet.



Section of Concrete Wall.
1 inch = 2 feet.



Cross-section.
1 inch = 2 feet.

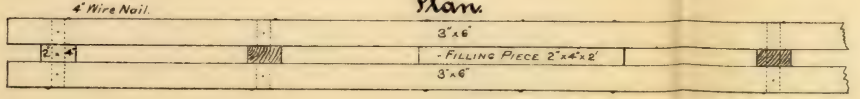


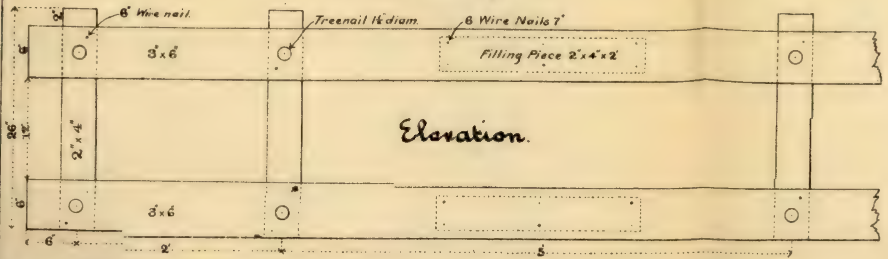
Longitudinal section.
1 inch = 2 feet.

Outside Frame.

1 inch = 1 foot.

Plan.





Elevation.

Details
of mattress construction
for improving the
Southwest Pass, Mississippi River.

Made under the direction of

Lt. Col. H. M. Adams, Corps of Engrs.

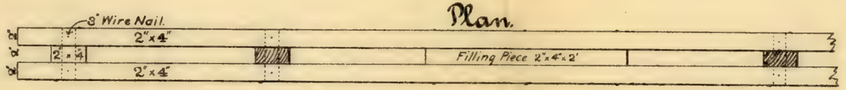
by

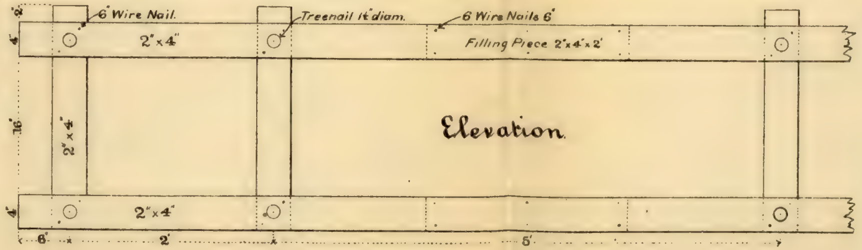
C. Donovan, Assist. Engr.

Inside Frame.

1 inch = 1 foot.

Plan.





Elevation.

To accompany my report for the year ending June 30, 1904.
H. M. Adams
Lt. Col. Corps of Engineers, U.S.A.

The Norris Peters Co., Photo-Litho. Washington, D.C.

LOCATION AND CONSTRUCTION OF THE JETTIES.

The location of the jetties is shown on sheet No. 1, herewith, and the details of the construction of mattresses and concrete capping are shown on sheet No. 2.

The mattresses are 200 feet long, 2 feet thick, and vary in width from 35 feet on the surface, or top mattress of the superstructure, to 100 and 150 feet for the bottom or foundation mattresses.

EAST JETTY.

The construction of the east jetty was begun December 31, 1903, at the shore end, and from that date to July 1, 1904, 63 foundation mattresses 200 by 100 by 2 feet were placed, as shown on sheet No. 1. The first 28 were built in place, on the mud, as the water was too shoal to float them, and they were loaded with 40 pounds of stone per square foot of mattress. The other 35 were built on mat ways, and when launched were towed to position in the jetty and secured in place by 50 pounds of stone per square foot.

The elevations of the upper surface of the mattresses now in place, with reference to mean high water, are shown on sheet No. 1.

Settlement and compression of mattresses.—The first 30 mats being above or near the surface of the water the elevation of three points on each mat was determined by level soon after the stone was placed on them and at intervals since that time. The elevation of the other 33 mats was obtained by carefully sounding over them.

As accurately as can be determined the settlement into the bottom of mattresses thus far placed varies from zero to 0.24 of a foot, the mean being 0.05 of a foot.

It is impracticable to determine with any great degree of accuracy the compression of the willows in a mat, due to the weight of stone placed upon them, particularly those below the surface of the water. In those where the upper surface is above the water the compression is not more than two or three tenths of a foot.

Thus far, and particularly during high river, the interstices between the willows are soon filled with sediment which the river water carries, and it is also deposited over the top of the mattresses. It is expected that this will take place in the case of each mattress and will so consolidate them that but little compression may be expected.

WEST JETTY.

Preparations have been made for building mattresses in place in the west jetty, and as soon as the river falls sufficiently to permit of an ample supply of willows being obtained, work will be begun on that jetty.

A trestle 3,600 feet long is nearly completed along the line of this jetty from the shore end. It consists of two-pile bents with caps, stringers, ties, and rails for a narrow-gauge track 4½ feet above mean high water. It is so built that one row of piles defines the channel edge of the foundation mattresses, being 50 feet from the center line of the jetty.

PROGRESS OF THE WORK.

Although the progress of the work has been very satisfactory, yet it has at times been retarded because of not being able to secure an ample supply of brush. This will be obtained, however, as soon as the river falls a few feet, as much brush may be obtained then that can not be cut at a higher stage of the river.

CONCLUSION.

In conclusion, I desire to commend Messrs. Jas. G. Ross and J. L. Dickey, junior engineers, and Mr. Lester F. Alexander, inspector, for the faithfulness and efficiency with which they performed their duties.

Respectfully submitted.

C. Donovan,
Assistant Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

S 4.

EXAMINATIONS AND SURVEYS AT SOUTH PASS, MISSISSIPPI RIVER.

In accordance with the provisions of the river and harbor act approved June 13, 1902, such examinations and surveys were made of the 14 miles of channel from the main river to the Gulf as were nec essary for full information relative to the depth and width of channel. Four charts showing this channel accompany a report herewith ol Mr. E. D. Jones, junior engineer.

The channel maintained compared very favorably in both depth and width with that during any previous year. During the fiscal year 53 ships drawing 26 feet or more navigated the pass. The deepest draft was 28 feet 11 inches.

Statement of expenditures on account of appropriation for examinations and surveys at South Pass, Mississippi River, from July 1, 1903, to June 30, 1904, inclusive, made in compliance with the river and harbor act of June 13, 1902.

Services	$8,250.49
Blueprint paper	.70
Total	8,251.19

Money statement.

July 1, 1903, amount appropriated by river and harbor act of June 13, 1902, for fiscal year 1904		$10,000.00
June 30, 1904, amount expended during fiscal year	$8,251.19	
July 1, 1904, outstanding liabilities (for services)	1,748.81	
July 1, 1904, total cost of operations during fiscal year		10,000.00

S 5.

MAINTENANCE OF SOUTH PASS CHANNEL, MISSISSIPPI RIVER.

For progress of the work, see Annual Report of the Chief of Engineers for 1901, pages 1881 to 1887; also reports for 1902, pages 1324 to 1332, and for 1903, pages 1279 to 1287.

For convenience of reference the operations for the past fiscal year are given under subheadings.

MAINTENANCE OF JETTIES AND AUXILIARY WORKS.

During the year repairs were made to upper dam, cut-off dike, and west dike, at the head of South Pass. The 37 wing dams in the jetty channel, seven in Grand Bayou reach, four in Goat Island reach, and one in Port Eads reach were maintained in good condition during the year by the addition of willows, stone, piles, and waling timber as required. Repairs were made to the inner west jetty and to the inner east jetty. Wharves and buildings at Port Eads were repaired and the floating plant maintained in good condition.

In the work of maintenance of the jetties and auxiliary works during the fiscal year 8,317.9 cords of willows, 5,533 cubic yards of stone, 757 piles, 186,760 feet B. M. of lumber, 10,805 pounds of nails and wire, 5,580 linear feet of waling timber, and 1,158 drift bolts were used. The total amount expended during the year for this purpose was $45,233.50.

DREDGING.

The dredge *Beta* worked in South Pass from July 1 to August 19, 1903, when, the channel being in such condition as no longer to require her services, the dredge was returned to the Mississippi River Commission, leaving South Pass on August 24 and arriving at West Memphis, Ark., on September 28, 1903. The operations of the dredge during the time she was at South Pass were divided as follows: Dredging, $52\frac{1}{2}$ hours; moving for steamers, $12\frac{11}{12}$ hours; arranging and care of plant and laying at bank, 393 hours; estimated number of cubic yards of material removed, 96,126. The amount expended on account of the operations of the dredge during this period and for returning the plant to West Memphis was $13,019.09.

Under authority of the Secretary of War the suction of the *Beta* was lengthened so that she could dredge to a depth of 35 feet, and necessary repairs were made to the dredge to put her in condition for six months' work at South Pass. This work was done during the months of January, February, and March, 1904, at West Memphis, Ark., under the supervision of Capt. Wm. B. Ladue, Corps of Engineers, and the cost, amounting to $3,503.25, paid from the appropriation for South Pass. The services of the dredge had not been required at South Pass to the end of the fiscal year.

From July 1 to August 15, 1903, the dredge *Sabine* was employed in removing a shoal that had formed in the channel in the Gulf beyond the ends of the jetties. The dredge left Port Eads on August 17 and arrived at Sabine Pass on August 18, 1903. The channel beyond the ends of the jetties having again shoaled, the *Sabine* was retransferred for work there, arriving at Port Eads on January 21, 1904. The furnaces were changed from oil burning to coal burning, and dredging was commenced on January 30 and continued until March 14, 1904. In accordance with telegraphic instructions of the Chief of Engineers, the dredge was returned to Sabine Pass, leaving Port Eads on March 16 and arriving at Sabine Pass on March 17, 1904. During the fiscal year the *Sabine* removed from the channel beyond the ends of the jetties at South Pass a total of 729 loads of material, containing approximately 142,155 cubic yards of solid matter. The cost of the operations of the dredge at South Pass and of transferring the dredge to and from Sabine Pass was $5,955.61.

The report herewith of Mr. E. D. Jones, junior engineer, is in detail and complete.

Money statements.

APPROPRIATION MADE BY RIVER AND HARBOR ACT OF JUNE 13, 1902.

July 1, 1903, balance unexpended	$50,081.43
Amount received from sale of United States property under provisions of section 5 of the river and harbor act of June 13, 1902	11.00
	50,092.43
June 30, 1904, amount expended during fiscal year	50,092.43

PERMANENT APPROPRIATION FOR FISCAL YEAR 1903.

July 1, 1903, balance unexpended	$100.00
June 30, 1904, amount expended during fiscal year	100.00

PERMANENT APPROPRIATION FOR FISCAL YEAR 1904.

July 1, 1904, amount appropriated by emergency river and harbor act approved June 6, 1900		$100,000.00
June 30, 1904, amount expended during fiscal year		65,864.08
July 1, 1904, balance unexpended		34,135.92
July 1, 1904, outstanding liabilities	$3,285.76	
July 1, 1904, amount covered by uncompleted contracts	14,762.79	
		18,048.55
July 1, 1904, amount reverting to Treasury		16,087.37

ABSTRACT OF APPROPRIATIONS.

Maintenance.

By act of Congress—	
Approved June 6, 1900 (indefinite) $100,000.00 annually	$400,000.00
Approved June 6, 1900 (allotted)	10,000.00
Approved June 13, 1902	75,000.00
	485,000.00
Amounts collected and deposited by United States district attorney for damages to works	1,139.89
Amount received from sale of United States property under provisions of section 5 of the river and harbor act of June 13, 1902	11.00
	486,150.89
Reverted to Treasury [a]	74,439.89

ABSTRACT OF CONTRACTS IN FORCE DURING FISCAL YEAR ENDING JUNE 30, 1904.

Name and address of contractor: The Johnson Iron Works (Limited), New Orleans, La.
Work: Furnishing and installing water-tube boiler in U. S. boat *Chere Amie.*
Contract price: $2,575.
Dated: September 23, 1903.
Date of completion: December 11, 1903.
Emergency contract: One-third of cost paid from appropriation for "Maintenance of South Pass channel, 1904," and two-thirds from appropriation for "Improving Southwest Pass, Mississippi River."

Name and address of contractor: W. G. Coyle & Co., New Orleans, La.
Work: Furnishing and delivering 10,000 barrels, more or less, of Pittsburg coal at Port Eads, La.
Contract price: 34.95 cents per barrel.
Dated: February 26, 1904.
Date of completion: March 1, 1904.
Emergency contract.

Name and address of contractor: Oscar F. Barrett, Cincinnati, Ohio.
Work: Furnishing and delivering 4,000 cubic yards, more or less, of stone on the bank in South Pass, Mississippi River.
Contract price: $3.65 per cubic yard.
Dated: June 16, 1904.
Date of expiration: September 14, 1904.
Emergency contract.

COMMERCIAL STATISTICS FROM JANUARY 1, 1903, TO DECEMBER 31, 1903.

Port of New Orleans, La.

[From information furnished by collector of port of New Orleans, La.]

Class.	Entered.		Cleared.	
	Number.	Tonnage.	Number.	Tonnage.
FOREIGN-BOUND VESSELS.				
Steamers	974	1,477,977	918	1,557,106
Sailing vessels	55	31,561	42	29,774
COASTWISE VESSELS.				
Steamers	291	701,388	205	457,736
Sailing vessels	26	18,760	24	9,523
Total	1,346	2,229,686	1,189	2,054,139

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[a] Amount given in annual report for 1903 as amount reverted to Treasury is incorrect.

Foreign exports and imports.

Articles.	Year ending December 31, 1903.	
	Tons.	Value.
EXPORTS.		
Cotton	503,587	$103,416,976
Cotton-seed oil	17,934	1,844,657
Cotton-seed cake and meal	232,984	5,128,427
Corn	373,302	6,599,397
Wheat	360,688	9,396,827
Wheat flour	134,686	5,275,786
Oats	575	14,937
Horses and mules	317	34,595
Leaf tobacco	16,279	3,127,156
Boards, deals, etc	174,630	2,486,591
Staves	103,592	2,108,848
Other lumber, and manufactures of	50,684	506,845
Lard and lard compounds	5,906	986,579
Beef, canned	1,689	325,263
Agricultural implements	5,958	1,694,835
Rosin	14,781	316,737
Turpentine	2,955	422,146
Tallow	2,019	201,872
Rice bran	8,706	139,296
Soap	3,477	208,628
Cordage	172	34,326
Cloths	10,941	273,531
Miscellaneous	135,512	4,065,374
Total exports	2,161,374	148,609,629
IMPORTS.		
Coffee	74,801	8,654,739
Cement	34,200	210,999
Sugar	155,511	6,236,943
Salt	4,343	27,530
Istle and sisal grass	38,133	4,967,637
Fruits and nuts	169,100	2,570,331
Fibers, manufactures of	28,971	2,831,927
Chemicals, drugs, etc	3,490	163,101
Wines, liquors, and beer	756	420,483
Cotton ties	225	6,838
Iron and steel, manufactures of	15,801	465,258
Tobacco and cigars	114	222,967
Matting	1,487	150,308
Fertilizers	8,158	53,026
Earthen, glass, and china ware	2,051	205,158
Rubber, crude	240	287,233
Cotton fabrics	16,473	420,081
Miscellaneous	10,655	2,131,121
Total imports	564,509	30,025,680
Total exports and imports	2,725,883	178,635,309

Domestic shipments and receipts by Southern Pacific Line of steamers (formerly Cromwell and Morgan lines).

Articles.	Year ending December 31, 1903.	
	Tons.	Value.
SHIPMENTS.		
Cotton	62,819	$12,877,895
Rice	17,886	679,668
Wool	136	40,800
Hides and leather	610	244,000
Bullion	432	6,912,000
Lumber	16,319	163,190
Sugar	51,077	2,043,080
Canned goods	56	11,200
Manufactured products and merchandise	12,220	1,466,400
Iron, steel, and metals	344	17,200
Agricultural products	1,269	31,725
Miscellaneous	14,403	576,120
Total shipments	177,571	25,063,278

Domestic shipments and receipts by Southern Pacific line of steamers—Continued.

Articles.	Year ending December 31, 1903.	
	Tons.	Value.
RECEIPTS.		
Cotton	3,592	736,360
Rice	53	2,014
Lumber	281	2,810
Sugar	2,269	90,760
Canned goods	10,869	2,173,800
Manufactured products and merchandise	105,989	12,718,680
Iron, steel, and metals	10,856	542,800
Agricultural products	2,149	53,725
Miscellaneous	22,994	919,760
Total receipts	159,052	17,240,709
Total shipments and receipts	336,623	42,303,987

REPORT OF MR. E. D. JONES, JUNIOR ENGINEER.

PORT EADS, LA., *July 1, 1904.*

SIR: I have the honor to report upon the maintenance of South Pass channel, Mississippi River, for the fiscal year ending June 30, 1904.

The work consisted of maintaining the existing jetties, dikes, dams, etc.; building and placing protection matresses around "Upper Dam" and "West dike" at Head of Passes; repairing and maintaining the plant, wharves, and buildings; examinations and surveys of the channel from deep water in the Mississippi River, through South Pass to deep water in the Gulf; and dredging.

MAINTENANCE OF JETTIES, DIKES, DAMS, ETC.

AT HEAD OF SOUTH PASS.

Upper dam.—This structure is 396 feet long. The upper row of piles at the east end was renewed and the dam filled with willows and ballasted with earth. Around the west end of the dam and the shore for a distance of 300 feet below it was protected from erosion by the use of willow mattresses; 9,755 square yards of mattress were used in this work.

Cut-off dike.—This dike formerly extended from Upper Dam down to the mainland, and prevented any wash between South Pass and Pass a Loutre.

In placing the mattresses below Upper Dam it was necessary to remove the part of the dike that had not been previously carried away by erosion of the bank, for a distance of 300 feet below Upper Dam. This part of the shore being protected by mattresses, it was found unnecessary to replace that portion of the dike. The remainder of the dike is in serviceable condition.

West dike.—This structure is really a west jetty at the head of South Pass. Three hundred and eighty feet of the dike was rebuilt, from the "Fog Bell" up to a point 93 feet below the original end. The dike was shortened with a view to decreasing the shoal that has existed for a long time on the South Pass side, near the upper end of the dike. The structure was filled with willows and ballasted with stone and earth.

Eight thousand four hundred and seventeen square yards of willow mattress were placed around this structure to prevent erosion and undermining of the dike.

IN SOUTH PASS.

Sections 305–315 (*Goat Island reach*).—In this reach there are five wing dams along the east shore that contract the width and assist in maintaining a channel through the reach. The uppermost dam (No. 10) was not repaired, as the pass at that point has a depth of 43 feet and is narrow enough to maintain this channel without the aid of the dam. The four remaining dams have been maintained in good condition.

Sections 155–210 (*Grand Bayou reach*).—There are seven wing dams along the east shore in this reach, two of which have been repaired during the year. All are in good condition.

AT THE MOUTH OF SOUTH PASS.

East and west jetties.—There was no perceptible change in the condition of the east or west jetties, and no work was done on them during the year.

Inner west jetty.—Five hundred feet of the crib, between Dam No. 9 and the west jetty light, was built 2 feet higher and filled with stone.

Inner east jetty.—A row of piles was driven along the river side of the jetty, from a point 350 feet below Dam No. 16 up to Dam No. 24, a distance of 3,150 feet. The piles were driven as close to the dams as a floating driver could be used; the remainder will be driven from the jetty with a portable driver.

The jetty was repaired with willows and stone from a point 250 feet above Dam No. 42 to Dam No. 5, from the sea end to a point 340 feet above, and from Dam No. 8 to 60 feet above Dam No. 12, a total distance of 2,325 feet. Some additional stone will have to be placed on the willows from the sea end up to 60 feet above Dam No. 12.

Wing dams in jetty channel.—There are 37 wing dams in this reach. Dams Nos. 9 and 36 were rebuilt. All have been maintained in good condition.

WHARVES AND BUILDINGS.

Wharves "B" and "C" (known as "Shop" and "Hotel," respectively), have been entirely rebuilt.

The carpenter shop and house No. 30 were untenantable and were torn down. The serviceable lumber obtained therefrom was used in rebuilding a carpenter shop on the river side of building No. 5.

The office building (No. 9) was raised 3 feet and otherwise repaired.

House No. 7 and the interior of house No. 8 were painted.

FLOATING PLANT.

The floating plant consists of 1 tug, 2 steam launches, 1 pile driver, 1 derrick boat, 8 barges, 1 yawl boat, and 5 skiffs.

The machinery was transferred from the old derrick barge to the new hull, and new mast and boom were installed. Barge *No. 1* was resheathed on sides and rakes, and new fender strakes were put on. New deck timbers and deck were put on barge *No. 8*. The entire plant has been maintained in serviceable condition.

EXAMINATIONS AND SURVEYS.

Weekly surveys were made of the shoaler reaches in South Pass and of the channel beyond the ends of the jetties; monthly surveys were made of the jetty channel and the channel beyond the ends of the jetties, and a detailed annual survey was made of the 14 miles of channel from the main river to deep water in the Gulf, the charts of which accompany this report.

All soundings from deep water in the Gulf to a point 5 miles above South Pass light were reduced to the plane of mean low tide, which is indicated by a reading of 3.1 feet on the Port Eads gauge; and the remainder of the pass to deep water in the Mississippi River were reduced to a reading of 1.96 feet on the Head of Passes gauge.

The following table gives the least depth of water through the shoaler reaches in South Pass, the jetty channel, and the channel beyond the ends of the jetties, for each month of the year:

Date.	Section 305-315.				Section 155-205.				Section 20-50.			
	Available depth.	Available width of channel.			Available depth.	Available width of channel.			Available depth.	Available width of channel.		
		26 foot.	28 foot.	30 foot.		26 foot.	28 foot.	30 foot.		26 foot.	28 foot.	30 foot.
1903.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
July	27.7	360	......	......	28.7	340	150	......	29.0	200	115	......
August	29.2	360	200	......	29.0	240	130	......	29.0	240	100	......
September	29.2	330	130	......	28.7	310	100	......	30.2	250	135	20
October	29.7	330	200	......	28.8	260	125	......	28.9	250	150	......
November	29.8	305	250	......	28.9	230	120	......	28.5	220	120	......
December	29.1	330	220	......	28.5	260	180	......	28.8	210	100	......
1904.												
January	29.2	270	220	......	28.5	260	90	......	28.1	180	80	......
February	29.4	290	210	......	29.1	240	130	......	28.3	200	50	......
March	29.5	290	180	......	29.0	210	125	......	28.4	195	105	......
April	28.8	280	200	......	29.1	250	120	......	29.2	250	120	......
May	28.4	290	50	......	28.9	240	175	......	29.1	230	160	......
June	28.9	270	100	......	29.6	270	175	......	29.0	230	150	......

Date.	Port Eads reach.				Jetty channel.				Beyond jetties.			
	Available depth.	Available width of channel.			Available depth.	Available width of channel.			Available depth.	Available width of channel.		
		26 foot.	28 foot.	30 foot.		26 foot.	28 foot.	30 foot.		26 foot.	28 foot.	30 foot.
1903.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
July	31.1	230	175	100	32.1	215	180	120	27.3	200	......	......
August	31.3	250	165	80	31.8	210	155	90	25.8	......	......	......
September	30.1	240	145	30	32.1	195	175	125	27.9	70	......	......
October	30.1	230	100	30	30.3	205	170	100	28.9	130	60	......
November	29.4	210	90	......	30.6	190	160	30	28.5	100	40	......
December	29.4	210	90	......	30.2	190	150	50	27.0	180	......	......
1904.												
January	29.1	195	120	......	30.7	180	130	70	28.0	170	40	......
February	28.8	180	120	......	30.0	165	145	......	29.0	180	160	......
March	28.8	190	100	......	30.3	170	125	40	31.0	450	120	50
April	29.7	210	125	......	31.0	170	150	95	29.2	250	50	......
May	30.5	200	175	80	30.5	225	180	70	28.5	150	30	......
June	30.5	235	155	80	30.2	200	160	20	26.7	135	......	......

DREDGING.

IN SOUTH PASS.

The dredge *Beta* worked in South Pass from July 1 to August 19, 1903, at such times as her services were necessary, in removing small shoals in the channel at sections 20–50, 158–164, and 305–315.

The channel through South Pass remained exceptionally good during the rise and fall of the river in 1903, there being no serious shoaling at any time. As the river had reached the low stage early in August, the services of the dredge were no longer required. The *Beta* left Port Eads, La., for West Memphis, Ark., on August 19, 1904.

During the high water of 1904, the channel through South Pass remained even better than last year, and the services of a dredge have not been required.

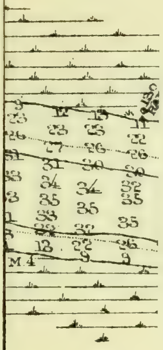
Operations of dredge Beta for year ending June 30, 1904.

Locality.	Dredging.	Moving for steamers.	Arranging plant and repairs.	Lying at bank.	Cut.		
					Length.	Width.	Depth.
	h. m.	*h. m.*	*h. m.*	*Days.*	*Feet.*	*Feet.*	*Feet.*
Sections 20–50	8 05	2 35	17 10	2	1,750	50	4.0
Sections 158–164	25 40	6 00	62 55	22	6,550	50	3.4
Sections 305–315	18 45	4 20	24 55	....	5,100	50	3.8
Total	52 30	12 55	105 00	24	13,400	....	....

BEYOND THE JETTIES.

The channel beyond the ends of the jetties has required considerable dredging during the year. On account of the long distance from the ends of the jetties to the present crest of the bar, the sediment is deposited in large quantities at a distance of 1,600 to 2,000 feet beyond the ends of the jetties. This natural deposit was augmented at times by "mud lumps," which appeared in the channel in that vicinity and which were very difficult to remove with the dredge, as they were small and of such material that the dredge scrapers had but little effect on them.

The dredge *Sabine* worked in the channel beyond the ends of the jetties from July 1 to August 17, 1903. The condition of the channel in the vicinity of the lumps remained about the same; otherwise the channel was in good condition.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No. 2.

CHART

OF A PART OF

SOUTH PASS

MISSISSIPPI RIVER.

SURVEYED—PLOTTED
UNDER THE DIRECTION OF
Lt. Col. H.M. Adams, Corps of Eng'rs U.S.A.
E. D. Jones, Junior Eng'r.

Plotted by Allen E. Washburn, Junior Engineer.

NOTE.

Depths are expressed in feet and refer to the plane of mean low tide, as indicated by a reading of 3.1 feet on U.S. Engineers' gage at Port Eads La.

Soundings October 7, 13 & 14. 1903.

Carrollton gage reading 24 feet.

26-foot curve . . . . . . ; 30-foot curve ——————.

Feet.

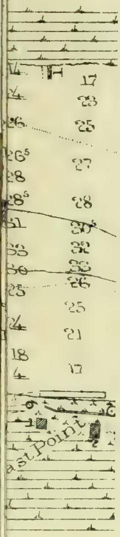
100 0 1 2 3 4 5 10 15

To accompany annual report for the fiscal year ending June 30, 1904.

H. M. Adams

Lieut. Col. Corps of Engineers, U.S.A.

THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.



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No. 1.

CHART
OF A PART OF
SOUTH PASS,
MISSISSIPPI RIVER.

SURVEYED AND PLOTTED
UNDER THE DIRECTION OF
Lieut. Col. H. M. Adams, Corps of Eng'rs, U.S.A.

Surveyed by E. D. Jones, Junior Engineer
Plotted by Allen E. Washburn, Junior Engineer.

Note.

Depths are expressed in feet and refer to the plane of mean low tide, as indicated by a reading of 3.1' feet on U.S. Engineers' Port Eads gage.

Soundings May 9, 10, 11 & 12, 1904. Carrollton gage, 15.6 ft.

28-foot curve .... 30-foot curve ————

To accompany my annual report for 1904.
H. M. Adams
Lieut. Col. Corps of Engrs. USA.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D.C.

No. 3.

CHART
OF A PART OF
SOUTH PASS
MISSISSIPPI RIVER.
SURVEYED—PLOTTED
UNDER THE DIRECTION OF
Lt. Col. H.M. Adams, Corps of Eng'rs, U.S.A.
E.D. Jones, Junior Eng'r.

Plotted by Allen E. Washburn, Junior Engineer.

NOTE.

Depths are expressed in feet and refer to the plane of mean low tide during low river, as indicated by a reading of 1.96 feet on U.S. Engineers' gage at Head of Passes.

Soundings October 14, 15, 17, 20 & 22, 1903.

Carrollton gage reading 2.7 feet.

26-foot curve ....; 30-foot curve ____________

Feet.
100 0 1 2 3 4 5 10 15 2000

To accompany annual report for the fiscal year ending June 30, 1904.

H. M. Adams

Lieut. Col., Corps of Engineers, U.S.A.

THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON, D. C.

CHART
OF THE

HEAD OF PASSES

MISSISSIPPI RIVER

showing location of jetties, dikes, dams etc.

SURVEYED & PLOTTED

UNDER THE DIRECTION OF

Lieut Col H M Adams Corps of Engrs. U S A

BY

E D Jones Junior Engr.

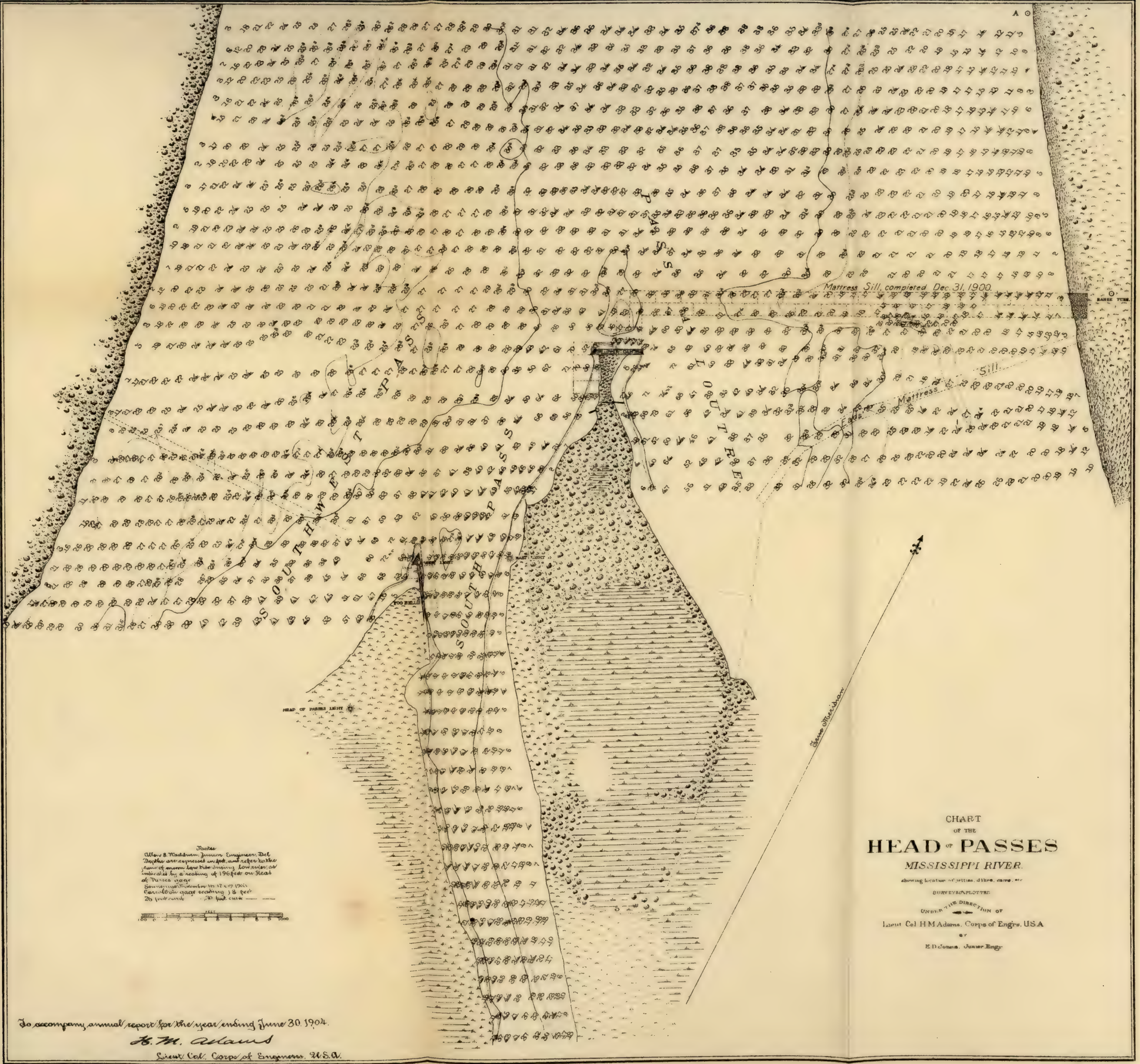

CHART
OF THE
HEAD OF PASSES
MISSISSIPPI RIVER.
showing location of jetties, dikes, dams, etc
SURVEYED & PLOTTED
UNDER THE DIRECTION OF
Lieut. Col. H. M. Adams, Corps of Engrs. U.S.A.
BY
E. D. Jones, Junior Engr.

Notes
Allen S. Washburn, Junior Engineer, Del.
Depths are expressed in feet, and refer to the plane of mean low tide during low water, as indicated by a reading of 1.96 feet on Head of Passes gage
Soundings November 16 to 17 1903
Carrollton gage reading 1.8 feet
26 foot curve ...... 30 foot curve ———

To accompany annual report for the year ending June 30, 1904.
H. M. Adams
Lieut. Col. Corps of Engineers, U.S.A.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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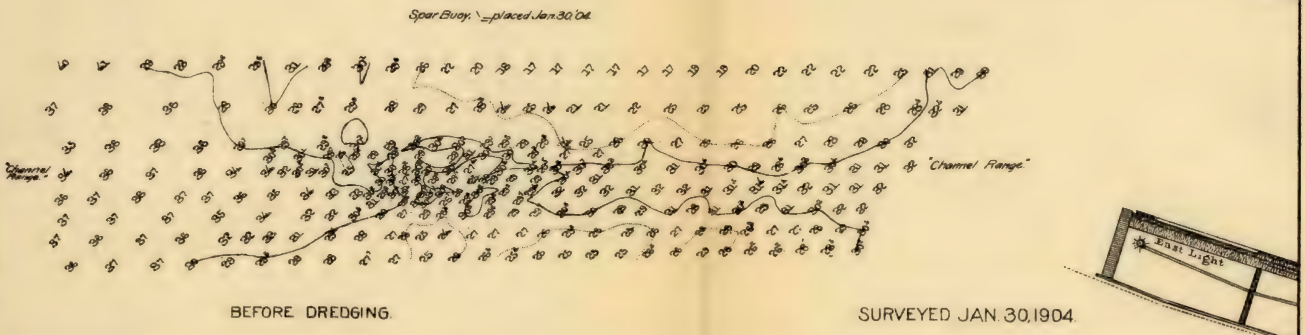
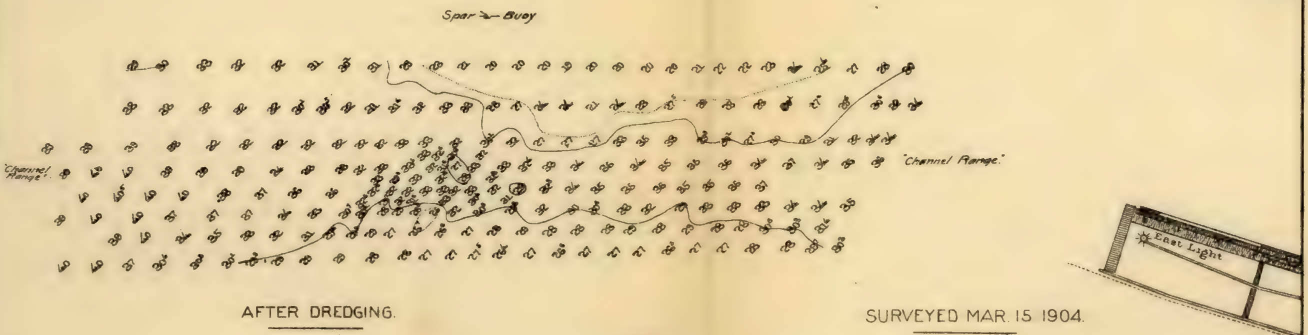


BEFORE DREDGING.

SURVEYED JAN. 30, 1904.



AFTER DREDGING.

SURVEYED MAR. 15 1904.

CHANNEL BEYOND ENDS OF JETTIES.
MOUTH OF SOUTH PASS, MISSISSIPPI RIVER.

UNDER DIRECTION OF

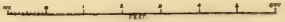
LIEUT. COL. H. M. ADAMS, CORPS OF ENG'RS. U.S.A.

Surveyed by E. D. Jones, Junior Eng'r. —— Plotted by Allen E. Washburn, Jr. Eng'r.

To accompany annual report for 1904.

H. M. Adams

Lieut. Col., Corps of Engineers, U.S.A.



Depths are in feet, and refer to the plane of mean low tide (3.1 feet on Port Eads gage).

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

During the low river the wave action and deep-draft ships diminished the size and number of lumps.

The shoal to the westward had gradually built out toward the channel, and became a constant danger to out-bound, deep-draft steamers.

The dredge *Sabine* again arrived at Port Eads, January 21, 1904, and, after changing the furnaces from oil to coal burning, began dredging in the channel beyond the ends of the jetties on January 30, 1904. The object was to deepen and widen the channel to the westward of the "channel range." The dredge did very efficient work, as shown by accompanying charts of surveys made before and after dredging. The last work was done on March 12, 1904. The *Sabine* took on coal and left for Sabine Pass, Tex., on March 16, 1904.

Operations of dredge Sabine for year ending June 30, 1904.

Locality.	Moving to and from dredging position.	Pumping.	Dumping.	Repairs.	Coaling.	Number of loads.
	h. m.	*h. m.*	*h. m.*	*h. m.*	*h. m.*	
Beyond jetties	63 30	474 45	118 20	164 15	118 30	729

THE FORCE EMPLOYED.

The permanent force consists of 2 junior engineers, 1 overseer, 1 master, 3 steam engineers, 1 carpenter, 1 leadsman, 1 stoker, 4 deck hands, 1 gauge observer, and 1 watchman, being 16 in number. This force was increased at times, as occasion demanded, by carpenters, calkers, etc. The laboring force averaged 16 men.

The following is a statement of labor and material expended in the maintenance of South Pass channel, Mississippi River, and where used:

Where used.	Labor.	Willows.	Stone.	Lumber.	Nails and wire.	Piles.	Timber 12 by 12 inches.	Bolts.
	Hours.	*Cords.*	*Cu. yds.*	*Ft. B. M.*	*Lbs.*	*No.*	*Lin. ft.*	*No.*
Upper Dam, Head of Passes	698.0	208.3				8	240	25
Mattresses for Upper Dam	7,078.0	1,518.0	1,518	83,200	5,960			
West dike, Head of Passes	3,899.0	1,029.6	68			128	1,320	198
Mattresses for West dike	7,135.0	1,380.9	1,694	78,720	5,540			
Dams in sections 155–210	240.0	116.8						
Dams in jetty channel	1,286.0	873.4	365			21	360	48
Inner west jetty	1,201.0		476				2,580	617
Inner east jetty	8,436.0	3,190.9	1,364			463		
Coal-yard wharf	161.5			1,090	50	22	300	45
Hotel wharf	1,093.5		48	13,617	130	45	780	121
Shop wharf	639.0			9,023	100	38		104
Tide-gauge house, Head of Passes	67.0			1,200	25	4		
Driving mooring piles	111.5					28		
Repairing coal yard	162.0							
Transferring coal from barge to coal yard	453.0							
Coaling dredges	862.5							
Breaking up coal boat	144.5							
Unloading ballast from ships	80.0							
Tearing down buildings Nos. 5 and 30	308.0							
Building new carpenter shop	444.5							
Repairing buildings, cisterns, etc	525.5							
Painting and repairing plant	1,754.0							
Cutting grass around houses	1,808.5							
Storing lumber and piles	171.0							
Extra labor on launch Reese, making surveys, etc	855.0							
Lost on account of rain	203.0							

Where used.	Labor.	Willows.	Stone.	Lumber.	Nails and wire.	Piles.	Timber 12 by 12 inches.	Bolts.
	Hours.	*Cords.*	*Cu. yds.*	*Ft. B. M.*	*Lbs.*	*No.*	*Lin. ft.*	*No.*
Witness, United States *v.* Geo. W. Bryan	83.0							
Raising and repairing office	635.5							
Wheeling sand under office	400.0							
Building stations, Southwest Pass	51.0							
Total	40,986.5	8,317.9	5,533	186,760	11,805	757	5,580	1,158

NAVIGATION OF THE CHANNEL.

Conditions having influence on the navigation of the channel through South Pass remained favorable throughout the year. Excepting the "mud lumps" which appeared beyond the ends of the jetties, there were no shoalings in the channel which menaced navigation. No case was noted of any vessel grounding in the pass so seriously as to require assistance or cause delay.

There were practically no delays to commerce caused by fogs. Although a very strong current was in evidence during the high stage of the river, no damage was done to the works by steamers.

Five outward-bound steamers went aground beyond the ends of the jetties, all cases due to failure to make the sharp turn in order to keep in the channel.

During the fiscal year just ended the following deep-draft steamships navigated South Pass:

One each with draft of 28 feet 11 inches, 28 feet 6 inches, 28 feet 1 inch, and 28 feet; 2 with draft of 27.5 feet, 5 of over 27 feet and less than 27.5 feet, 7 drawing 27 feet, 23 of over 26 feet and less than 27 feet, and 12 drawing 26 feet. A total of 53 steamships drawing 26 feet or more.

Very respectfully, your obedient servant,

E. D. Jones,
Junior Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

S 6.

IMPROVEMENT OF BAYOU LAFOURCHE, LOUISIANA.

No work was done during the past fiscal year, as a dam has been constructed across the head of the bayou by State levee boards, under authority of act of Congress approved June 13, 1902. No estimate for additional funds for this improvement is submitted, as the time for the removal of the dam has been extended to December, 1907, by joint resolution of Congress approved April 13, 1904.

The expenditures during the year were for expenses incurred in the collection of commercial statistics.

Money statement.

July 1, 1903, balance unexpended	$2,122.15
June 30, 1904, amount expended during fiscal year	62.89
July 1, 1904, balance unexpended	2,059.26

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
Approved June 13, 1878	$10,000
Approved March 3, 1879	10,000
Approved June 14, 1880	5,000
Approved July 5, 1884	5,000
Of August 11, 1888	50,000
Approved September 19, 1890	50,000
Approved July 13, 1892	50,000
By act of Congress—	
Of August 18, 1894	$40,000
Passed June 3, 1896	25,000
Approved March 3, 1899 (maintenance)	7,500
Approved June 13, 1902 (maintenance)	7,500
Total	260,000

COMMERCIAL STATISTICS.

[From January 1, 1903, to December 31, 1903, inclusive.]

Vessels entering and departing.

	Number.	Trips.	Net registered tonnage.
Steamers	22	702	71,463
Sailing vessels	20	300	3,000
Barges	11	882	125,780
Total	53	1,884	200,243

Draft of heaviest vessel: Light, 2 feet; loaded, 9 feet.

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Merchandise	2,397	$181,416
Rice	290	11,140
Potatoes and onions	3,705	97,625
Sugar	16,206	1,296,488
Molasses	10,620	361,080
Moss	116	4,640
Total	33,334	1,952,389
RECEIPTS.		
Coal	30,000	126,000
Fuel oil	14,186	100,677
Merchandise	16,831	865,825
Total	61,017	1,092,502
Grand total	94,351	3,044,891

S 7.

IMPROVEMENT OF BAYOU PLAQUEMINE AND GRAND RIVER AND PIGEON BAYOUS, LOUISIANA.

For a detailed record of the improvements see Annual Report of the Chief of Engineers for 1896, pages 1496–1500; for 1897, pages 1759–1760; for 1898, pages 1471–1472; for 1900, pages 2251–2258; for 1901, pages 1890–1898; for 1902, pages 1334–1340; for 1903, pages 1289–1295.

The river and harbor act of June 3, 1896, authorized continuing contracts to be entered into to complete the project, not to exceed $1,173,250, exclusive of amounts therein and previously appropriated. This entire amount, with the exception of $13,250, has since been appropriated by Congress.

For convenience of reference the operations are given under subheadings.

PLAQUEMINE LOCK.

The foundation for the lock was completed December 31, 1897, under contract with E. A. Burriss, dated June 24, 1895.

A continuing contract for construction of lock and excavating for approaches was entered into with Stewart & Co., of St. Louis, Mo., on May 28, and approved June 17, 1898. The work was commenced in August, 1898. Under this contract the floor and walls of the lock were constructed, and miter sills, inlet pipes, and snubbing hooks placed. No actual work was done under the contract after November 15, 1900. By direction of the Chief of Engineers, supplemental contract was entered into with the contractors on June 18, and approved by the Secretary of War, June 24, 1903, annulling their contract upon payment to them of the retained percentages, and other items claimed by them, aggregating $24,236.41.

Contract for constructing the lock gates was entered into on February 8, approved February 19, 1904, with the Penn Bridge Company, of Beaver Falls, Pa., the contract time for completion of the gates being August 23, 1905. No work on the ground at Plaquemine had been commenced by the contractors to the end of the fiscal year. (It is understood that working and detail drawings for the gates have been made by the contractors, and preparations made for constructing the material for the gates.)

For testing purposes 100 tons of pig iron were placed on one pivot stone of the gates in July, and a second 100 tons on another pivot stone in November, 1901, and removed in May, 1902.

Contract was entered into November 18, approved December 30, 1899, with the Otis Elevator Company, of New York, N. Y., for constructing operating machinery and power house for the lock, to be completed within the six months after date of notice to commence shall have been given. Notice had not been given and no work had been done under this contract to June 30, 1904. The commencement of this work is contingent upon the progress made on the construction of the lock gates.

The purchase of 1.25 acres of land on the north side of the river approach to the lock for $3,500 and 0.31 acre on the south side of the river approach for $4,000 was completed August 24, 1900. This land is required in connection with the construction of the approaches to the lock.

Bids for constructing the approaches to the river and bayou ends of the lock, including excavation and fill behind the lock walls, were opened August 18, 1903; three bids were received and rejected as excessive. Bids were again invited, to be opened October 29, 1903, but no proposals were received. By authority of the Chief of Engineers, the construction of the approaches will be postponed until work on the lock gates is under way.

During April, 1904, a pumping plant was installed at the bayou end of the lock to keep the lock pit dry.

ENLARGING BED OF BAYOU PLAQUEMINE.

Contract with Chas. Clarke & Co., of Galveston, Tex., for excavating to enlarge the bed of Bayou Plaquemine from the railroad bridge at Plaquemine to deep water below Dardennes Bend, was entered into July 15 and approved September 13, 1899, work to be completed June 30, 1901; the time limit on the contract has been waived for a reasonable period. The total estimated amount of excavation included in this contract, place measurement, is 1,027,509 cubic yards, the contract price being 13.98 cents per cubic yard. The contractors began dredging October 29, 1899, on the cut through the point at Dardennes Bend, opening same to navigation in January, 1900, making a cut 2,400 feet long. Four hundred and two thousand six hundred and thirty cubic yards of material were removed to June 5, 1902, when the contractors suspended operations. Work was resumed on May 24, 1904, and 8,600 cubic yards of material excavated to June 30, 1904.

GRAND RIVER AND PIGEON BAYOUS.

These streams form part of the Plaquemine all-water route, connecting a number of navigable streams of Louisiana with the Mississippi River, and their improvement was added to the general project by act of July 13, 1892.

Dredging and snagging operations were carried on in these streams from 1893 to 1897, but obstructions continued to form.

Dredging and snagging operations were carried on in Grand River from June 30, 1900, to April 20, 1901, from a point 3½ miles above Bayou Pigeon, in that stream, and on down toward Bayou Posteo. A bar at the mouth of Bay Natchez was also removed.

A survey of Grand River from Pigeon Bayou to the Atchafalaya River near Morgan City, through Bay Natchez, Bayou Long, and Flat Lake, was completed March 25, 1901. A project was approved April 20, 1901, and modified March 21, 1902, for dredging channel through Flat Lake and Bay Natchez, and a contract with Chas. Clarke & Co. was entered into April 3 and approved May 1, 1902, for dredging a channel 50 feet wide and 10 feet deep, at 20 cents per cubic yard. The work was commenced in Flat Lake July 5 and in Bay Natchez August 7, 1902, and 282,122 cubic yards of material removed to June 30, 1903. During the past fiscal year 87,076 cubic yards of material were removed. The channel through Flat Lake was completed on January 30, 1903, and through Bay Natchez on May 14, 1904. Channels 50 feet wide and 9,733 feet long in Flat Lake and 35,189 feet long in Bay Natchez were excavated, a total of 369,198 cubic yards of material being removed.

The work done during the year is fully described in the accompanying report of Mr. J. I. Conklin, assistant engineer, at Plaquemine, La., to which attention is invited.

One of the results of the high water in the Mississippi River during 1903 was to erode and cut away the bank near the site of the lock. It is recommended that a mattress 600 by 400 feet be placed in the river in front of the lock site, at an estimated cost of $35,000. An estimate for these funds is submitted. Caving also took place in the river bank about 4,000 feet above the lock site in November and December, 1903. It is believed that the bank at this locality should be protected by willow mattresses weighted with stone, at estimated cost of $80,000.

It is proposed to apply the available balance to the credit of this appropriation in completing the lock and approaches and dredging in Bayou Plaquemine.

Money statement.

July 1, 1903, balance unexpended	$626,984.55
June 30, 1904, amount expended during fiscal year	55,726.47
July 1, 1904, balance unexpended	571,258.08
July 1, 1904, outstanding liabilities	6,661.60
July 1, 1904, balance available	564,596.48
July 1, 1904, amount covered by uncompleted contracts	342,184.15
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	35,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harber act of 1899.

ABSTRACT OF APPROPRIATIONS.

By act of Congress—		By sundry civil act approved—	
Of August 11, 1888	$100,000	June 4, 1897	$350,000
Approved September 19, 1890	100,000	March 3, 1899	400,000
Approved July 13, 1892	150,000	June 6, 1900	200,000
Of August 18, 1894	110,000	March 3, 1901	210,000
Of June 3, 1896	20,000	Total	1,640,000

ABSTRACT OF CONTRACTS IN FORCE DURING THE YEAR ENDING JUNE 30, 1904.

For constructing operating machinery and power house for lock.

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Otis Elevator Co., New York, N. Y.	Nov. 18, 1899	Dec. 30, 1899	When notice shall be given to the contractor.	Six months after notice to commence has been given.

The entire work to be completed for an amount of $114,000.

Notice to commence had not been given and no work had been done up to June 30, 1904.

For dredging to enlarge the bed of Bayou Plaquemine from the railroad bridge to deep water below Dardennes Bend.

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Chas. Clarke & Co., Galveston, Tex.	July 15, 1899	Sept. 13, 1899	Nov. 12, 1899	June 30, 1901; extended to June 30, 1902; time limit waived.

About 1,027,509 cubic yards of material to be removed; contract price, 13.98 cents per cubic yard; total amount, about $143,645.76.

A total of 411,230 cubic yards of material had been removed up to June 30, 1904.

For dredging Flat Lake and Bay Natchez, Grand River, Louisiana.

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Chas. Clarke & Co., Galveston, Tex.	Apr. 3, 1902	May 1, 1902	July 5, 1902	July 5, 1903; time limit waived.

For removing 369,198 cubic yards of material; contract price, 20 cents per cubic yard.

Contract completed May 14, 1904.

For constructing lock gates.

Name and address of contractor.	Dated.	Approved.	Date of beginning.	Date of expiration.
Penn Bridge Co., Beaver Falls, Pa	Feb. 8, 1904	Feb. 19, 1904	May 23, 1904	Aug. 23, 1905

Items.	Approximate quantities.	Prices.	Amounts.
Rivet steel ... pounds	105,000	$\$0.06\frac{8}{10}$	$7,140.00
Soft steel ... do	1,732,000	$.06\frac{8}{10}$	117,776.00
Medium steel ... do	20,870	.10	2,087.00
Cast steel ... do	116,496	.08½	9,902.16
Cast iron ... do	4,400	.08	352.00
Bronze ... do	1,320	.60	792.00
Iron pipe for walk ... linear feet	1,565	.12	187.80
Timber for walk ... feet B. M.	1,273	60.00M	76.38
Sluice valves for gates ... number	16	85.00	1,360.00
Completing miter sills ... do	5	450.00	2,250.00
Forged steel ... pounds	1,000	.10½	105.00
Total			142,028.34

COMMERCIAL STATISTICS FROM JANUARY 1, 1903, TO DECEMBER 31, 1903.

Vessels entering and departing.

Number		165
Net registered tonnage		3,875
Draft of heaviest vessel:		
Light	feet	6
Loaded	do	10

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Merchandise	75,000	$1,800,000
Sugar cane	40,000	160,000
Total	115,000	1,960,000
RECEIPTS.		
Fish, oysters, fur, and produce	12,500	550,000
Coal and fuel	40,000	180,000
Logs	135,000	2,250,000
Total	187,500	2,980,000
Grand total	302,500	4,940,000

NOTE.—At present no vessels are engaged in regular trade on Bayou Plaquemine. The principal part of the freight is handled in small flats. There is no way of determining the tonnage or number of trips made by each.

REPORT OF MR. J. I. CONKLIN, ASSISTANT ENGINEER.

PLAQUEMINE, LA., *June 30, 1904.*

SIR: I have the honor to submit the following report of the work under appropriations for improving Bayou Plaquemine and Grand River, Louisiana, in charge of this office, for the fiscal year ending June 30, 1904:

Plaquemine lock.—There has been no actual construction at Plaquemine during the fiscal year. The amount of work previously done is represented by the following quantities:

Excavation	cubic yards	29,833
Concrete	do	80,832
Granite	cubic feet	6,072
Cast iron	pounds	129,198
Medium steel	do	5,900
High steel, cast	do	32,256
High steel, forged	do	15,955
Bronze	do	624

The following items of work are necessary to complete the Plaquemine lock:

1. Construction of lock gates.
2. Construction of power house and operating machinery.
3. Excavation between lock and railroad bridge, construction of approaches, and fill behind lock walls.

The work included in the first two items is provided for by contract. The work included in the third item is not provided for, and on account of the critical relation of the work to the annual high water in the Mississippi River can not be advantageously undertaken until work in the first two items is done.

In view of the fact that the United States undertakes to keep the lock chamber pumped out during the period of the erection of the gates an agreement was entered into with Henry Nadler for furnishing and installing a pumping plant at the bayou end of the lock comprising: One 20-horsepower upright boiler, one 15-horsepower horizontal engine, and one 6-inch centrifugal pump. The price for this plant was $1,050.

This plant was completed and tested April 30, 1904, and the chamber of the lock was pumped out. There was at the time of commencing 17 feet of water over the lock floor. It was found that in order to completely drain the lock chamber it would be necessary to purchase an additional pump to care for the water that would not drain into the wellhole on account of settlement of sides of the chamber. The water was sufficiently lowered so that levels could be taken on June 8, 1904, and there was found very little variation in the levels since the last levels were taken on June 15, 1902.

The walls have spread apart one-tenth of a foot, increasing the distance from center to center of pivot. As soon as the pump is installed so these points can be accurately located, the exact conditions will be determined and provided for in the gates.

Bank protection.—During the extreme low water of December, 1903, a cave developed just above the mattress placed in 1901 and 1902. The cave is about 1,000 feet in length. There should be placed to protect this point mattresses to cover an area 1,300 by 400 feet, and connect with the work of 1901–2. The critical need of this work, as also the work recommended in last annual report to be done near the position of Dike 3, is emphasized; estimated cost, $115,000.

Dredging in Bayou Plaquemine.—There is included in the contract for the rectification of Bayou Plaquemine 1,027,509 cubic yards of excavation. Up to July 1, 1902, there had been taken out 402,630 cubic yards of material. Work was resumed under this contract in May, 1904, the contractor bringing to the work the dredges *Gen. C. M. Shelley* and dredge *No. 1* from the Grand River work.

The plan followed by the contractor is to excavate the channel with the dredge *Shelley*, tow the earth in scows to Dardennes Bend, and redredge the material into the dumping ground with the *No. 1*. It is expected later to redredge the material with a suction dredge. The contractor is not yet thoroughly equipped for the work, and much of the time during May and June, 1904, has been used in getting ready.

	Cubic yards.
Work done in May, 1904	3,600
Work done in June, 1904	5,000

Dredging in Grand River.—There is embraced in the contract for excavating a 50-foot channel 10 feet deep, with perpendicular sides, in Flat Lake and Bay Natchez, 369,198 cubic yards. There had been removed to June 30, 1903, 282,122 cubic yards.

One of the features of this contract was that the material excavated should be placed at least 300 feet from the excavated channel, and it was designed to use a suction dredge for this purpose, as the depth of water would not admit of the use of dump scows. So many large cypress stumps were encountered in the bottom of the cut that the use of the suction dredge was given up, and the contractor constructed an inclined chute on scows into which there was pumped a 6-inch stream of water, the material being placed in the chute with a dipper dredge. This method worked quite satisfactorily after adjusting the incline and size of the chute to the conditions.

The contract was completed May 14, 1904, and a channel 10 feet in depth and 50 feet wide is provided through the heretofore shallow flats through Flat Lake and Bay Natchez. Attention is called to the fact that while the depth of this channel is ample, the 50-foot width is not sufficient to make the channel of much service to any amount of navigation, and it is also dangerous for vessels of any size on account of serious obstructions in the form of stumps that reach nearly to the top of the water, and are close to the edge of the cut. To be of practical utility the channel should be 125 feet in width, the width provided for in Bayou Plaquemine.

The following is a summary of the work for the year:

	Cubic yards.
July, 1903	17,288
October, 1903	7,975
November, 1903	8,550
December, 1903	12,850
March, 1904	17,200
April, 1904	18,175
May, 1904	5,038
Total	87,076

Clearing timber from banks of Grand River.—The reach of Grand River from Bayou Sorrel to the lower line of Chopin plantation is very narrow and swift, and the banks are caving. The heavy timber was so close to the banks of the stream that every time a cave occurred the timber falling would block the stream. An agreement was made with J. P. Lapassade to cut the timber back on both banks to a distance of 60 feet at a price per mile of single bank of $200. The work was completed September 26, 1903, 4.5 miles having been cleared.

Very respectfully, your obedient servant,

J. I. Conklin,
Assistant Engineer

Lieut. Col. H. M. Adams,
Corps of Engineers.

S 8.

IMPROVEMENT OF BAYOU TECHE, LOUISIANA.

A history of the progress of the work will be found in the Annual Report of the Chief of Engineers for 1896, pages 1503 and 1504; see also Annual Report for 1897, page 1764, and Annual Report for 1900, page 2260.

No work of improvement was undertaken during the last fiscal year, the funds available not being sufficient. The expenditures made during the year were for expenses incurred in collecting commercial statistics and for mileage in connection with inspection of a bridge.

Bayou Teche is an important commercial stream of southern Louisiana, and is the waterway for shipping for the numerous sugar, rice, and cotton plantations located along its banks. With the exception of snags, the channel is in a fairly good condition below New Iberia, but of late years it has shoaled considerably between New Iberia and St. Martinville, and is not navigable above the latter point except during high-water stages. The improvement of channel accomplished will not be a permanent one, as sunken logs and fallen trees are constantly forming obstructions which will require removal, and the large drainage ditches emptying into the bayou form shoals at their mouths.

It is believed that $10,000 can be advantageously expended during the ensuing fiscal year in dredging and removing obstructions from the channel.

Money statement.

July 1, 1903, balance unexpended	$26.18
June 30, 1904, amount expended during fiscal year	26.18
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement	10,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
Approved July 11, 1870	$17,500
Approved June 14, 1880	6,000
Approved March 3, 1881	20,000
Approved July 5, 1884	6,500
Approved September 19, 1890	5,000
Passed August 18, 1894	6,000
By act of Congress—	
Passed June 3, 1896	$10,000
Approved March 3, 1899	10,000
Approved June 13, 1902 (maintenance)	7,500
Total	88,500

COMMERCIAL STATISTICS.

[From January 1 to December 31, 1903, inclusive.]

Vessels entering and departing.

	Number.	Trips.	Net registered tonnage.
Steamers	45	1,167	96,991
Sailing vessels	15	360	1,800
Barges	66	2,749	436,046
Total	126	4,276	534,837

Draft of heaviest vessel: Light, 2 feet; loaded, 7 feet.

Shipments and receipts.

Articles.	Tons.	Value.
SHIPMENTS.		
Brick	1,609	$4,274
Lumber	17,296	185,572
Merchandise	36,565	150,300
Cotton	221	77,280
Cotton-seed products	2,467	49,629
Rice	5,787	222,574
Sugar	35,991	2,879,280
Sugar cane	63,000	220,500
Molasses	8,230	279,820
Total	171,166	4,069,229
RECEIPTS.		
Lumber	201,783	744,791
Machinery	1,395	139,500
Fuel oil	41,850	297,000
Fertilizer	2,745	45,392
Coal	15,000	76,500
Cooperage	2,002	33,033
Merchandise	14,601	969,478
Total	279,376	2,305,694
Grand total	450,542	6,374,923

APPENDIX T.

IMPROVEMENT OF HOMOCHITTO RIVER, MISSISSIPPI, AND OF CERTAIN RIVERS AND HARBORS IN SOUTHERN LOUISIANA AND EASTERN TEXAS.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, CAPT. C. S. BROMWELL, CORPS OF ENGINEERS, AND LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS.

IMPROVEMENTS.

1. Homochitto River, Mississippi.
2. Bogue Chitto, Chefuncte River and Bogue Falia, Tickfaw River and tributaries, and Amite River and Bayou Manchac, Louisiana.
3. Channel, bay, and passes of Bayou Vermilion and Mermentau River and tributaries, Louisiana.
4. Mouth and passes of Calcasieu River, Louisiana.
5. Johnsons Bayou, Louisiana.
6. Removing water hyacinths from Louisiana waters.
7. Mouths of Sabine and Neches rivers, Texas.
8. Sabine River, Texas.
9. Harbor at Sabine Pass, Texas.

EXAMINATIONS AND SURVEY.

10. Bayou Grosse Tete, Louisiana.
11. Sabine Lake and Sabine and Neches rivers, Texas.
12. Sabine River, Louisiana and Texas.
13. Tangipahoa River, Louisiana.
14. Bayou Tigre, Louisiana.

HARBOR LINES.

15. Sabine Pass, Texas.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., June 30, 1904.

GENERAL: I have the honor to submit herewith annual report of operations for works of river and harbor improvement under my charge at this office for the fiscal year ending June 30, 1904.

Very respectfully, your obedient servant,

H. M. ADAMS,
Lieut. Col., Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

T 1.

IMPROVEMENT OF HOMOCHITTO RIVER, MISSISSIPPI.

For the original and present projects for this work see Annual Report of the Chief of Engineers for 1899, page 1862, and 1903, page 1299.

No operations were carried on during the fiscal year ending June 30, 1904, on account of inadequacy of available funds, such expenditures as were made being for obligations previously incurred.

Money statement.

July 1, 1903, balance unexpended	$430.10
June 30, 1904, amount expended during fiscal year	7.00
July 1, 1904, balance unexpended	423.10

ABSTRACT OF APPROPRIATIONS.

By act of Congress, approved March 3, 1899	$16,000
By act of Congress, approved June 13, 1902 (maintenance)	2,000
Total	18,000

COMMERCIAL STATISTICS.

No detailed commercial statistics were available for the period from January 1, 1903, to December 31, 1903, but it has been ascertained that about 7,000,000 feet of cypress lumber, valued at about $70,000, and cotton and cotton seed, valued at about $45,000, were transported over this stream during the past calendar year.

Two small steamers, with an aggregate of 223 tons, were engaged in this trade.

T 2.

IMPROVEMENT OF BOGUE CHITTO, CHEFUNCTE RIVER, BOGUE FALIA, TICKFAW RIVER AND TRIBUTARIES, AMITE RIVER, AND BAYOU MANCHAC, LOUISIANA.

(A) BOGUE CHITTO.

For original condition of this stream, previous projects, and results accomplished thereunder see Annual Reports of the Chief of Engineers for 1891, page 1800; 1892, page 1406; 1897, page 1703; 1899, page 1729; 1900, page 2222, and 1903, page 1300.

The traffic over this stream consists principally of the rafting of timber and the floating of logs, and is carried on by 5 or 6 firms. Only about 85 or 90 miles of the river is ever navigable, and but a short length is navigable during low water.

The part of the stream which is navigable has been improved as far as practicable, but will require the removal of sunken logs from time to time unless something be done to prevent the floating of loose logs, which are constantly sinking and obstructing the river.

No work was done during the fiscal year ending June 30, 1904, available funds being insufficient. Such expenditures as were made during the year were for contingencies and administration.

Money statement.

July 1, 1903, balance unexpended	$323.34
June 30, 1904, amount expended during fiscal year, $26.65, to which should be added $87.40 expended during fiscal year ending June 30, 1903, but not reported	114.05
July 1, 1904, balance unexpended	209.29
Amount (estimated) required for completion of existing project	30,000.00

ABSTRACT OF APPROPRIATIONS.

By act of Congress—

Approved September 19, 1890	$5,000
Approved July 13, 1892	5,000
Of August 18, 1894	5,000
Passed June 3, 1896	5,000
Approved March 3, 1899	5,000
Approved June 13, 1892 (allotted)	3,000
Total	28,000

COMMERCIAL STATISTICS.

The principal business of this stream is the rafting of timber for sawmills in its immediate vicinity, and during the year ending December 31, 1903, about 44,950 pieces of timber, valued at about $113,700, were floated.

(B) CHEFUNCTE RIVER AND BOGUE FALIA.

For previous and present projects for this work see Annual Reports of the Chief of Engineers for 1873, page 634; 1880, page 1182; 1884, page 1270; 1889, page 1530; 1893, page 1808; 1895, page 1742; 1899, page 1834, and 1903, page 1301.

No work was done during the past fiscal year, there being no funds available.

Money statement.

Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement	$3,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—

Approved March 3, 1881	$1,500.00
Passed August 2, 1882	1,500.00
Approved August 5, 1886	2,500.00
Approved September 19, 1890	1,000.00
Approved July 13, 1892 (maintenance)	1,000.00
Of August 18, 1894 (maintenance)	1,000.00
Passed June 3, 1896 (maintenance)	1,000.00
Approved March 3, 1899 (maintenance)	1,000.00
Approved June 13, 1902 (maintenance)	3,000.00
	13,500.00
February 24, 1903, amount transferred to allotment for "Improving Amite River and Bayou Manchac, Louisiana"	1,194.01
Total balance	12,305.99

COMMERCIAL STATISTICS.

No commercial statistics were available for the calendar year ending December 31, 1903. The commerce over these streams consists mainly of cotton, cotton seed, hides, junk and old iron, charcoal, miscellaneous merchandise, and building materials, of which about 130,000 tons, valued at about $400,000, was carried by 6 steamers, 20 sailing vessels, and 9 barges, with an aggregate tonnage of about 1,457 tons.

(C) TICKFAW RIVER AND TRIBUTARIES, LOUISIANA.

For previous and present projects for this work and results accomplished thereunder see Annual Reports of the Chief of Engineers for 1880, page 1184; 1892, page 1484; 1893, page 1811; 1897, page 1753; 1899, page 1835; and 1903, page 1303.

No work was possible during the past fiscal year owing to the insufficiency of funds.

Money statement.

July 1, 1903, balance unexpended	$79.44
July 1, 1904, balance unexpended	79.44
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	1,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—

Approved March 3, 1881	$2,000
Passed August 2, 1882	2,000
Approved August 5, 1886	2,000
Of August 11, 1888	1,000
Approved September 19, 1890	1,000
Approved July 13, 1892 (maintenance)	1,000
Passed August 18, 1884 (maintenance)	1,000
Passed June 3, 1896 (maintenance)	1,000
Approved March 3, 1889 (maintenance)	1,000
Approved June 13, 1902 (maintenance)	[a]1,000
Total	13,000

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[a] Allotted.

COMMERCIAL STATISTICS.

No detailed commercial statistics covering the traffic over this stream were available for the calendar year ending December 31, 1903, but it is estimated that about 50,000 tons of miscellaneous freight, consisting principally of lumber, staves, wool, hides, logs, cotton, and cotton seed, the estimated value of which is given at $215,000, have been transported from the different points on this river and its tributaries. Eight steamers, 11 sailing vessels, and 2 barges, with a tonnage of about 450 tons, were engaged in this trade.

(D) AMITE RIVER AND BAYOU MANCHAC, LOUISIANA.

For previous projects for this work and results accomplished thereunder see Annual Reports of the Chief of Engineers for 1880, page 1157; 1883, page 1105; 1884, page 1263; 1889, page 1529; 1891, page 1821; 1892, page 1486; 1893, page 1813; 1899, page 1837; and 1903, page 1305.

No work toward the removal of snags, logs, etc., that have accumulated in this river and Bayou Manchac has been done during the past two fiscal years, for the reason that the available funds were not sufficient.

It is estimated that $2,500 will be annually required to maintain the existing improvement.

Money statement.

July 1, 1903, balance unexpended	$133.66
Amount deposited to the credit of the appropriation by Capt. W. L. Fisk, June 12, 1891	2.50
	136.16
July 30, 1904, amount expended during fiscal year	.54
July 1, 1904, balance unexpended	135.62
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	2,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
Approved June 14, 1880	$8,000.00
Approved March 3, 1881	5,000.00
Approved August 5, 1886	2,000.00
Of August 11, 1888	5,000.00
Approved September 19, 1890	3,800.00
Approved July 13, 1892 ($1,500 for maintenance)	2,500.00
Of August 18, 1894 (maintenance)	2,500.00
Passed June 3, 1895 (maintenance)	2,500.00
Approved March 3, 1899 (maintenance)	2,500.00
Approved June 13, 1902 (maintenance)	[a] 2,500.00
	36,300.00
February 24, 1903, amount transferred from allotment for "Improving Chefuncte River and Bogue Falia, Louisiana"	1,194.01
Total	37,494.01

COMMERCIAL STATISTICS.

No commercial statistics for the calendar year ending December 31, 1903, were available, but it is believed that the commerce of these streams was about the same as the calendar year 1902.

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[a] Allotted.

T 3.

IMPROVEMENT OF CHANNEL, BAY, AND PASSES OF BAYOU VERMILION, AND MERMENTAU RIVER AND TRIBUTARIES, LOUISIANA.

(A) CHANNEL, BAY, AND PASSES OF BAYOU VERMILION.

For previous projects for this work and results accomplished thereunder, see Annual Reports of the Chief of Engineers for 1880, pages 1157–1165; 1883, page 1107; 1887, page 1398; 1891, page 1856; 1893, page 1826; 1895, page 1766; 1899, page 1850; and 1903, page 1306. Project for maintenance (1892) was approved by the Secretary of War August 12, 1892.

The project approved July 12, 1902, provided for the maintenance of the improvement by the removal of obstructions (snags, logs, etc.) from the bayou from its mouth to the Southern Pacific Railway bridge, or as far as available funds would permit, the work to be done by the hire of a suitable snagging plant.

Under the contracts with Victor von Schoeler, of Franklin, La., approved October 30, 1902, and (emergency) of June 6, 1903, the bayou was cleared of obstructions and overhanging trees to the Southern Pacific Railway bridge near Lafayette, La., which work was completed November 4, 1903, by the removal of 520 overhanging trees and 553 obstructions, such as snags, logs, etc. At date of completion of this work the bayou was navigable for a distance of 60 miles from its mouth, with a depth averaging from 4 to 12 feet and a width of 60 feet.

This improvement, however, is not permanent, and it is estimated that $2,000 will annually be required for the maintenance of navigation over this stream.

Money statement.

July 1, 1903, balance unexpended	$4,274.03
December 31, 1903, amount transferred from allotment for "Improving Mermentau River and tributaries, Louisiana"	200.00
	4,474.03
June 30, 1904, amount expended during fiscal year	4,437.23
July 1, 1904, balance unexpended	36.80
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	2,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
Approved July 13, 1892	$7,500
Passed August 18, 1894	5,000
Passed June 3, 1896	1,000
Approved March 3, 1899	2,500
Approved June 13, 1902 (allotted)	9,000
	25,000
December 31, 1903, amount transferred from allotment for "Improving Mermentau River and tributaries, Louisiana"	200
Total	25,200

COMMERCIAL STATISTICS FROM JANUARY 1, 1903, TO DECEMBER 31, 1903.

Vessels entering and departing.

ass.	Number.	Trips.	Net registered tonnage.
Steamers	5	178	3,738

Draft of heaviest vessel: Light, 2 feet; loaded, 5 feet.

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Cotton and cotten seed	2,775	$235,000
Sugar cane	6,000	19,500
Sugar and molasses	152	9,120
Rice	1,600	65,000
Cattle	480	18,000
Total shipments	11,007	346,620
RECEIPTS.		
Fuel oil	2,800	16,000
Lumber	700	6,000
Merchandise	500	37,500
Machinery and iron	100	10,000
Miscellaneous	50	2,000
Total receipts	4,150	71,500
Grand total	15,157	418,120

(B) MERMENTAU RIVER AND TRIBUTARIES, LOUISIANA.

For previous and present projects for this work and results accomplished thereunder see Annual Reports of the Chief of Engineers for 1897, page 1767; 1900, page 2264 (maintenance); and 1903, page 1308.

No field work was done during the fiscal year ending June 30, 1904, there not being sufficient available funds for expenditure to advantage. Expenditures made during the year represent expenses for administration and contingencies.

Money statement.

July 1, 1903, balance unexpended	$1,048.91
December 31, 1903, amount transferred to allotment for "Improving channel, bay, and passes of Bayou Vermilion, Louisiana"	200.00
	848.91
June 30, 1904, amonnt expended during fiscal year	76.75
July 1, 1904, balance unexpended	772.16
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	3,500.00

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
Approved July 13, 1892	$7,500.00
Passed August 18, 1894	5,000.00
Passed June 3, 1896	5,000.00
Approved March 3, 1899	6,115.25
Approved June 13, 1902	2,500.00
	26,115.25
December 31, 1903, amount transferred to allotment for "Improving channel, bay, and passes of Bayou Vermilion, Louisiana"	200.00
Total balance	25,915.25

COMMERCIAL STATISTICS FROM JANUARY 1, 1903, TO DECEMBER 31, 1903.

Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers	7	130	4,887
Sailing vessels	9	78	1,624
Total	16	208	6,511

Draft of heaviest vessel: Light, 2 feet; loaded, 6 feet.

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Rice	17,760	$721,500
Cotton and cotton seed	2,520	174,900
Cattle	206	12,300
Brush, cordwood, shells, etc	1,732	3,464
Hides and furs	2	200
Total shipments	22,220	912,364
RECEIPTS.		
Fuel oil	8,400	35,000
Logs and lumber	29,000	82,000
Merchandise, flour, and feed	2,500	163,000
Coal	1,190	5,355
Machinery and iron	380	38,000
Total receipts	41,470	323,355
Grand total	63,690	1,235,719

T 4.

IMPROVEMENT OF MOUTH AND PASSES OF CALCASIEU RIVER, LOUISIANA.

For previous projects for this work and results accomplished thereunder see Annual Reports of the Chief of Engineers for 1871, page 558; 1872, page 61; 1881, pages 1302–1304; 1882, page 1387; 1886, page 1277; 1887, pages 1379–1403; 1895, page 1772; 1900, page 2266; and 1903, page 1309.

The present project for this work was approved July 3, 1902, and provides for redredging the channel through the inner pass to its original depth of 8 feet, and repairing the revetment built to prevent the return of the dredged material; also the repairs to and extension of the east jetty.

The above project was submitted to cover the expenditure of $75,000 appropriated June 13, 1902, which, together with an unexpended balance of $498.87, made the sum of $75,498.87 available for this work.

That portion of the present project relating to redredging the existing channel was completed at date of last annual report. Nothing was done during the past fiscal year on the work of repairs to and extension of the east jetty. Expenditures made during the year have been for administration, contingencies, and necessary examinations.

Money statement.

July 1, 1903, balance unexpended	$60,286.22
June 30, 1904, amount expended during fiscal year	329.51
July 1, 1904, balance unexpended	59,956.71
July 1, 1904, amount (estimated) covered by uncompleted contract	55,000.00
Amount (estimated) required for completion of present project	242,681.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	125,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
Approved June 10, 1872	$15,000
Approved March 3, 1881	15,000
Passed August 2, 1882	10,000
Approved July 5, 1884	6,500
Of August 11, 1888	10,000
Approved September 19, 1890	75,000
Approved June 13, 1892	100,000
Passed August 18, 1894	90,000
Passed June 3, 1896	80,000
Approved March 3, 1899	35,000
Approved June 13, 1902	75,000
Total	511,500

ABSTRACT OF CONTRACT IN FORCE DURING FISCAL YEAR ENDING JUNE 30, 1904.

Name and address of contractor: John Short, St. Louis, Mo.

Work: Repairs to and extension of east jetty at Calcasieu Pass, La.

Contract prices: Brush mattress in place, 95 cents per square yard; riprap stone in place, $2.50 per ton; granite blocks in place, $1.50 each.

Total approximate amount covered by contract: $55,000.

Dated: October 10, 1902.

Approved: November 15, 1902.

Date of expiration: November 19, 1903; time limit waived.

COMMERCIAL STATISTICS FROM JANUARY 1, 1903, TO DECEMBER 31, 1903.

Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers	6	452	16,272
Sailing vessels	20	184	7,980
Barges	6	59	3,686
Total	32	695	27,938

Draft of heaviest vessel: Light, 6 feet; loaded, 8 feet.

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Lumber	5,625	$27,000
Cotton and cotton seed	1,018	84,010
Cordwood, etc	8,000	24,000
Rice	2,712	97,945
Total shipments	17,355	232,955
RECEIPTS.		
Logs	173,400	360,000
Merchandise	1,400	105,000
Fuel oil	2,000	10,725
Total receipts	176,800	475,725
Grand total	194,155	708,680

T 5.

IMPROVEMENT OF JOHNSONS BAYOU, LOUISIANA.

For present project for this work, see Annual Report of the Chief of Engineers for 1903, page 1311.

No work was done during the fiscal year ending June 30, 1904, none being considered necessary.

Money statement.

July 1, 1903, balance unexpended	$238.65
July 1, 1904, balance unexpended	238.65

ABSTRACT OF APPROPRIATION.

By act of Congress approved March 3, 1899	$2,500

COMMERCIAL STATISTICS FROM JANUARY 1 TO DECEMBER 31, 1903.

Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Sailing vessels	10	220	2,800

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Cotton and cotton seed	200	$14,000
Melons and garden truck	300	10,000
Cattle	875	35,000
Hides and furs	4	4,000
Miscellaneous	8	1,000
Total shipments	1,387	64,000
RECEIPTS.		
Merchandise	200	15,000
Lumber	1,000	7,500
Machinery	25	2,500
Total receipts	1,225	25,000
Grand total	2,612	89,000

T 6.

REMOVING THE WATER HYACINTH, LOUISIANA.

The present project for this work, modified by the river and harbor act of June 13, 1902, provides for the construction of a boat fitted up to admit of exterminating the plants by chemical means, and for the construction of log booms to be used as adjuncts to the boat. The project approved by the Secretary of War August 1, 1902, provides for the destruction of water hyacinths in Bayou Plaquemine, Grand River, Flat Lake, and Bay Natchez, Louisiana; this was modified September 26, 1902, to permit of necessary repairs to the floating log boom at the mouth of Bayou Teche, Louisiana, and its operation for two years.

For results accomplished under these projects see Annual Report of the Chief of Engineers for 1903, pages 1312–1313.

The *Ramos* continued operations in Bayou Plaquemine, Grand River, Bayou Grossetete, and Bay Natchez until October 26, 1903, when operations were suspended for the season. At that date there had been 165,800 gallons of the Harvesta chemical compound sprayed over an area estimated at 1,818,362 square yards of hyacinths.

With funds allotted May 31, 1904, repairs were made to the *Ramos* at New Orleans, La., for putting the boat in condition to resume operations, and she left on June 29 for Bayou Plaquemine to begin the spraying of the hyacinths in that stream.

Money statement.

July 1, 1903, balance unexpended	$9,623.37
December 4, 1903, amount allotted	500.00
May 31, 1904, amount allotted	15,000.00
	25,123.37
June 30, 1904, amount expended during fiscal year	10,123.37
July 1, 1904, balance unexpended	15,000.00
July 1, 1904, outstanding liabilities	1,042.88
July 1, 1904, balance available	13,957.12
Amount that can be profitably expended during fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897.	20,000.00

ABSTRACT OF APPROPRIATION AND ALLOTMENTS.

By act of Congress approved March 3, 1899	$36,000
Allotted August 6, 1902	18,000
Allotted September 26, 1902	1,480
Allotted December 4, 1903	500
Allotted May 31, 1904, act of April 28, 1904	15,000
Total	70,980

T 7.

IMPROVEMENT OF THE MOUTHS OF THE SABINE AND NECHES RIVERS, TEXAS.

For previous projects for this work and for improving Neches River, Texas, see Annual Reports of the Chief of Engineers for 1878, page 611; 1879, page 909; 1880, page 1202; 1887, page 1384; 1897, page 1789; 1900, page 2274; and 1903, page 1314.

Under authority of the Chief of Engineers dated January 25, 1904, a survey was made February 13, 1904, and a project submitted April 23, 1904, covering the estimated cost for constructing the proposed barge channel through Sabine Lake, connecting the Sabine and Neches rivers with Taylors Bayou. This project was approved by the War Department May 6, 1904, and proposals for the work have been invited, to be opened July 18, 1904.

Under this project it is proposed to excavate a channel 8 feet deep and 100 feet wide from the mouth of the Sabine River into Sabine Lake, thence generally parallel to the shore line to a point opposite Port Arthur, and thence into Taylors Bayou. A channel of the same dimensions is to be dredged from the mouth of the Neches River, following the present channel and making connection with the channel above described. The estimated cost of the proposed work, to be done under contract, is $125,000.

Money statement.

July 1, 1903, balance unexpended	$125,074.71
June 30, 1904, amount expended during fiscal year	20.40
July 1, 1904, balance unexpended	125,054.31

ABSTRACT OF APPROPRIATIONS.

By act of Congress approved—	
March 3, 1899	$10,000
June 13, 1902	125,000
Total	135,000

COMMERCIAL STATISTICS FROM JANUARY 1 TO DECEMBER 31, 1903.

Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers	15	280	3,845
Barges	12	335	45,695
Total	27	615	49,540

Draft of heaviest vessel: Light, 4 feet; loaded, 6 feet.

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Sand and shells	60,000	$90,000
Lumber	10,000	50,000
Fuel oil	31,560	90,170
Fresh water	1,512	6,050
Wood	800	2,400
Miscellaneous	1,000	20,000
Total shipments	104,872	258,620
RECEIPTS.		
Logs	45,000	80,000
Merchandise	800	60,000
Miscellaneous	1,000	20,000
Total receipts	46,800	160,000
Total shipments and receipts	151,672	418,620

T 8.

IMPROVEMENT OF SABINE RIVER, TEXAS.

For previous and present projects for this work and results accomplished thereunder, see Annual Reports of the Chief of Engineers for 1873, page 881; 1879, page 904; 1880, page 1195; 1886, page 1287; 1892, page 1510; 1893, page 1836; 1895, page 1779; 1897, page 1773; 1899, page 1857; 1900, page 2274, and 1903, page 1316.

No work was done during the fiscal year ending June 30, 1904.

Money statement.

July 1, 1903, balance unexpended	$161.67
July 1, 1904, balance unexpended	161.67

ABSTRACT OF APPROPRIATIONS.

By act of Congress—	
Approved June 10, 1872 (allotted)	$2,700
Approved June 18, 1878	10,000
Approved March 3, 1879	6,000
Approved June 14, 1880	5,000
Approved March 3, 1881	7,000
Passed August 2, 1882	4,000
Approved July 13, 1892	5,000
Passed August 18, 1894	5,000
Passed June 3, 1896	2,000
Approved March 3, 1899 (maintenance)	2,000
Amount allotted by sundry civil act of March 2, 1895, from appropriation of August 18, 1894, for "improving Sabine Pass, Texas"	4,000
Total	52,700

COMMERCIAL STATISTICS FROM JANUARY 1 TO DECEMBER 31, 1903.

Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers	6	352	7,938
Sailing vessels	7	54	1,664
Barges	12	300	48,930
Total	25	706	58,532

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Rice	1,160	$58,165
Cattle	844	42,190
Brick, sand, and shells	1,580	5,370
Lumber	27,000	135,000
Miscellaneous	1,000	20,000
Total shipments	31,584	260,725
RECEIPTS.		
Machinery, iron, etc	160	16,000
Fuel oil	1,176	6,300
Merchandise	260	19,500
Miscellaneous	160	2,900
Logs	292,421	438,000
Total receipts	294,177	482,700
Total shipments and receipts	325,761	743,425

T 9.

IMPROVEMENT OF HARBOR AT SABINE PASS, TEXAS.

For previous and present projects and results accomplished thereunder, see Annual Reports of the Chief of Engineers for 1875, page 947; 1877, page 75; 1878, page 609; 1882, pages 1436–1437; 1883, page 1054; 1891, pages 1831–1835; 1896, page 1814; 1898, page 1482; 1899, pages 1859–1862; 1900, pages 2276–2277; 1901, pages 1912–1918, and 1903, pages 1317–1318.

The dredge *Sabine* was operated in the channel between the jetties from August 19, 1903, to January 19, 1904, with necessary interruptions for repairs to machinery, etc., and on the latter date was sent to the South Pass of the Mississippi River under authority of the Chief of Engineers for emergency work at that locality. The *Sabine* returned to Sabine Pass on March 10, 1904, and continued operations dredging in the channel between the jetties until May 12, 1904, on which date the dredge was sent to New Orleans, La., for repairs to her machinery rendered necessary by the accidental breaking of her starboard shaft.

Up to and including the last-named date the dredge had removed and carried out to sea 254,280 cubic yards of material, at a total cost of $16,743.26, or 6.58 cents per cubic yard. The present available depth of the channel at mean low tide is 23½ feet.

It is not believed that a depth of 25 feet can be maintained throughout the jetty channel until the jetties are raised to the level of mean high water.

Repairs to east jetty.—Work under the contract approved November 15, 1902, with John Short, of St. Louis, Mo., was commenced August 5, 1903, and continued with slight interruptions, due to scarcity of rock, rough weather, accidents to contractor's plant, etc., until May 2, 1904, when work was entirely suspended owing to financial troubles of the contractor. To the end of the fiscal year operations had not been resumed, but it is expected that they will be at an early date.

During the period above specified 28,143 tons of heavy riprap stone were placed in the three breaks in the east jetty, leaving about 10,000 tons still to be placed to complete the work in accordance with the terms of existing contract. The sum of $63,364.43 had been expended under this contract to the end of the fiscal year.

During the past fiscal year a survey from the Gulf of Mexico to Sabine Lake was completed; also a survey for a new harbor line, the latter being approved by the Secretary of War August 12, 1903. A map of the survey of Sabine Pass, from the Gulf of Mexico to Sabine Lake, showing soundings throughout the Pass and jetties, is herewith; also report of Mr. F. F. Axtell, junior engineer.

Money statement.

July 1, 1903, balance unexpended		[a]$142,393.18
August 24, 1903, amount deposited to credit of the appropriation		14.38
		142,407.56
June 30, 1904, amount expended during fiscal year		86,020.95
July 1, 1904, balance unexpended		56,386.61
July 1, 1904, outstanding liabilities		10,836.55
July 1, 1904, balance available		45,550.06
July 1, 1904, amount (estimated) covered by uncompleted contract		25,000.00
Amount (estimated) required for completion of existing project		1,016,573.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For work of improvement	$500,000.00	
For maintenance of improvement	30,000.00	
		530,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

ABSTRACT OF APPROPRIATIONS.

By act of Congress:	
From act approved August 30, 1852 (survey)	$5,000.00
Allotted from act approved June 10, 1873 (survey)	2,000.00
By act of Congress—	
Approved March 3, 1875	20,000.00
Approved August 14, 1876	38,000.00
Approved June 18, 1878 (allotted)	30,000.00
Approved March 3, 1879	25,000.00
Approved June 14, 1880	50,000.00
Approved March 3, 1881	150,000.00
Approved August 2, 1882	150,000.00
Approved July 5, 1884	200,000.00
Approved August 5, 1886	198,750.00
Of August 11, 1888	250,000.00

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[a] Amount given in annual report for 1903 as balance unexpended July 1, 1903, is incorrect, Treasury settlement No. 143654, for 58 cents, not having been deducted.

By act of Congress—Continued.

Approved September 19, 1890	$300,000.00
Approved July 13, 1892	350,000.00
Of August 18, 1894	[a] 271,000.00
Of June 3, 1896	75,000.00
Approved June 4, 1897 (sundry civil)	480,000.00
Approved June 1, 1898 (sundry civil)	400,000.00
Approved March 3, 1899 (sundry civil)	264,000.00
Approved March 3, 1899 (river and harbor)	150,000.00
Approved June 6, 1900 (sundry civil)	36,000.00
Approved June 6, 1900 (emergencies in river and harbor works) (allotted)	10,000.00
Approved June 13, 1902 (river and harbor)	185,000.00
Total	3,639,750.00
Reverted to Treasury from act of June 4, 1897	16,297.03
Net total	3,623,452.97

ABSTRACT OF CONTRACT IN FORCE.

Name and address of contractor: John Short, St. Louis, Mo.
Work: Repairs to and extension of east jetty.
Contract price: Riprap stone in place, $2.50 per ton.
Total approximate amount covered by contract: $95,000.
Dated: October 10, 1902.
Approved: November 15, 1902.
Date of expiration: November 19, 1903; time limit waived.

COMMERCIAL STATISTICS FROM JANUARY 1 TO DECEMBER 31, 1903.

Vessels entering and departing.

Class.	Number.	Trips.	Net registered tonnage.
Steamers	52		
Sailing vessels	11		
Barges	31		
Total	94	584	698,277

Draft of heaviest vessel: Light, 16 feet; loaded, 24.8 feet.

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[a] The total amount of this appropriation was originally $275,000, but of this sum $4,000 was allotted by sundry civil act of March 2, 1895, for dredging through a bar at the mouth of the Sabine River, Texas, and was expended on that improvement.

Shipments and receipts by water.

Articles.	Tons.	Value.
SHIPMENTS.		
Crude petroleum	965,750	$3,282,483
Refined oils	178,787	1,710,865
Cotton	23,802	4,760,350
Wheat	43,612	726,867
Flour	730	32,841
Lumber	95,234	533,316
Miscellaneous	2,043	30,116
Total shipments	1,309,958	11,076,838
RECEIPTS.		
Creosote	1,950	39,000
Cement	3,340	33,400
Total receipts	5,290	72,400
Total shipments and receipts	1,315,248	11,149,238

REPORT OF MR. F. F. AXTELL, JUNIOR ENGINEER.

SABINE, TEX., *June 25, 1904.*

COLONEL: I have the honor to submit the following report of operations for improving harbor at Sabine Pass, Texas, for fiscal year ending June 30, 1904:

The work at Sabine Pass Harbor has consisted of dredging between the jetties by the U. S. dredge *Sabine*, the repair of the jetties, under contract with John Short, of St. Louis, Mo., and miscellaneous and survey work.

Dredging between the jetties.—The U. S. dredge *Sabine* has divided its time between dredging here and at South Pass, mouth of the Mississippi River, under orders from the Secretary of War. During the year the dredge was absent from this harbor engaged in dredging at South Pass for 109 days, leaving 257 days for dredging in this harbor. Of these 257 days chargeable to dredging at Sabine Pass harbor, the distribution of time was as follows:

Dredging	124½ days, or	48 per cent.
Time lost	132½ days, or	52 per cent.
Total	257 days.	100 per cent.

Of the 132½ days' lost time the distribution was as follows:

	Days.
Repairs	67
Installing fuel oil burners	20
Sundays and legal holidays	27
Rough weather preventing work	13½
Cleaning boilers	5
Total	132½

During the 124½ days devoted to dredging, the dredge *Sabine* removed from between the jetties and carried out to sea 1,304 loads of mud, the estimated solid contents of which was 254,280 cubic yards. This material was deposited in the Gulf about one mile to westward of west jetty.

Total expenses of dredge *Sabine* for fiscal year was $16,743.26. Cost of dredging, 6.58 cents per cubic yard.

At the end of last fiscal year there was an available depth through the jetty channel of 22½ feet at mean low tide. The present available depth is 23½ feet at same stage. June 17, 1904, the steamer *Washtenaw*, drawing 24.8 feet, assisted by a tug, went out through the jetty channel. Tide was about one foot above mean low. Some difficulty was encountered, but the passage was safely made.

Repair of the jetties.—A contract was entered into October 10, 1902, with John Short, of St. Louis, Mo., for the repair of three breaks in east jetty at Sabine Pass, caused by the storm of September, 1900. The commencement of work under this contract was delayed from time to time, the actual placing of rock in the work beginning August 5, 1903. This contract has not been vigorously prosecuted at any time, and at the end of the present fiscal year the work is temporarily suspended pending the attempt of the contractor to secure additional financial assistance to carry on the work.

At the end of present fiscal year there has been placed in the three breaks in east jetty 28,143.68 tons of heavy riprap stone, leaving about 10,000 tons yet to be placed to complete the contract.

With the exception of the repair work, the condition of the jetties is practically the same as it was a year ago.

Miscellaneous and survey work.—During the year a triangulation survey of Sabine Pass from Gulf of Mexico to Sabine Lake was completed, observations were made for azimuth, and a table showing the distances and true azimuth bearings between all stations was prepared. The table accompanies this report.

A new harbor line was established for Sabine Pass Harbor during the past year, it being approved by the Secretary of War August 12, 1903. A table accompanying this report gives the approved true azimuth bearings and distances of the several courses of this line, beginning at harbor point "O," which is a 1½-inch galvanized iron pipe placed in west jetty. Connected with the west harbor line, and parallel to it, there was very carefully run out a reference line on the west shore of the pass, the angles of which line are marked by 3-inch galvanized iron pipe set in concrete. A table has been prepared and accompanies this report giving the true azimuth bearings from these reference pipes to all prominent objects in the vicinity, also distances and true azimuth bearings to the corresponding angles of the west harbor line. By this method of shore reference line it is but a matter of a few hours for anyone to at any time correctly locate the west harbor line at any point in the pass.

Duplicate line of levels was run during October and November, 1903, from the tide gauge at Sabine, Tex., to all triangulation stations along the west bank of Sabine Pass and Sabine Lake, to all west harbor line reference points, bench marks, etc., from Gulf of Mexico to mouth of Neches River, Texas, a distance of 22 miles. Descriptions and elevations of all bench marks along this stretch are given in table accompanying this report.

In May, 1904, the annual survey of Sabine Pass was made. This is a complete hydrographic and topographic survey of the pass from the Gulf of Mexico to Sabine Lake. Map of this survey, in two sheets, accompanies this report.

The jetty channel has been inspected and sounded almost monthly during the past year.

An automatic tide gauge is now being maintained here. The record secured is almost continuous for the past year. From these records the hourly gauge readings are secured. In time an accurate determination of mean low Gulf level will be secured.

Respectfully submitted.

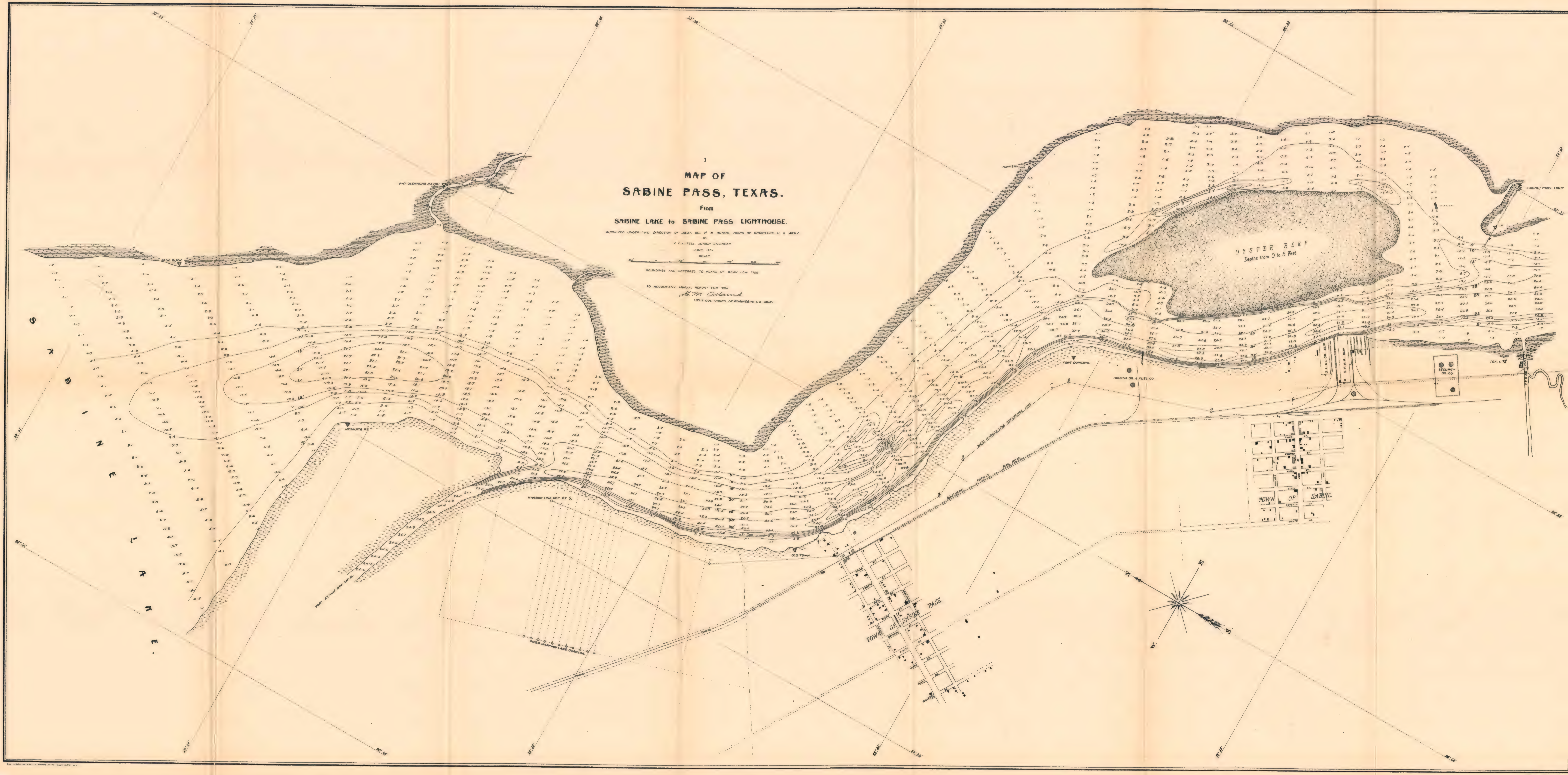
F. F. Axtell,
Junior Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

TRIANGULATION SYSTEM OF SABINE PASS, TEXAS.

Table of azimuths and distances.

From station—	Azimuth.	Back azimuth.	To station—	Distance.
	° ′ ″	° ′ ″		*Feet.*
P. G. Bayou (Coast and Geodetic Survey Station).	330 36 21.5	150 37 21.5	Light-house	21,739.9
	82 11 08	262 10 38	Mesquite Point	5,222.1
	133 38 19	313 37 59	Blue Buck	5.589.2
	16 25 53	196 25 33	Old Town	10,199.5
	345 32 05	165 32 25	Fort Dowling	13,187.6
	328 39 15	148 39 55	Junkerville	11,839.0
	12 04 00		Baptist Church spire	
Mesquite Point	193 52 19	13 52 29	Blue Buck	4.704.6
	123 35 15	303 33 50	Round Lake	18,720.3
	345 50 07	165 50 17	Old Town	9,357.1
	161 43 34		Railroad depot	
	145 47 32		Water tank	
	347 51 13		Baptist Church spire	
Round Lake	312 14 30		Light-house	
	320 35 50		Baptist Church spire	
	187 29 12		Railroad depot	
Blue Buck	109 05 49	289 04 14	Round Lake	17,696.2
	355 08 03	175 08 03	Old Town	13,689.4
	138 52 24		Water tank	
	355 06 55		Baptist Church spire	



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MAP OF
SABINE PASS, TEXAS.

From

SABINE LAKE to SABINE PASS LIGHTHOUSE.

SURVEYED UNDER THE DIRECTION OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS U. S. ARMY.
BY
F. F. AXTELL, JUNIOR ENGINEER.
JUNE, 1904.

SCALE.

SOUNDINGS ARE REFERRED TO PLANE OF MEAN LOW TIDE

TO ACCOMPANY ANNUAL REPORT FOR 1904.
H. M. Adams
LIEUT. COL. CORPS OF ENGINEERS, U. S. ARMY.

THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON D. C.

2.

MAP OF SABINE PASS, TEXAS.

From

SABINE PASS LIGHTHOUSE to GULF OF MEXICO.

SURVEYED UNDER THE DIRECTION OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS. U S ARMY.

BY

F. F. AXTELL, JUNIOR ENGINEER.

JUNE, 1904

SCALE:

SOUNDINGS ARE REFERRED TO PLANE OF MEAN LOW TIDE.

TO ACCOMPANY ANNUAL REPORT FOR 1904.

H. M. Adams

LIEUT COL CORPS OF ENGINEERS. U S ARMY

Table of azimuths and distances—Continued.

From station—	Azimuth.	Back azimuth.	To station—	Distance.
	° ′ ″	° ′ ″		*Feet.*
Old Town	272 04 16	92 05 16	Junkerville	9,049.8
	295 47 21	115 48 01	Fort Dowling	6,863.2
	304 01 11	....	Light-house	....
	355 00 30	....	Baptist Church spire	....
Fort Dowling	227 08 20	47 08 40	Junkerville	3,908.2
	313 23 32	133 24 07	Louisiana 1	8,918.2
	330 52 05	150 52 25	Texas 1	8,713.0
	93 19 37	....	Baptist Church spire	....
	355 27 05	....	Sabine hotel	....
	309 53 50	....	Light-house	....
Junkerville	337 38 00	157 38 15	Louisiana 1	9,500.3
	352 22 08	172 22 08	Texas 1	10,361.1
	332 56 00	....	Light-house	....
	18 09 13	....	Sabine hotel	....
	75 18 00	....	Baptist Church spire	....
Texas 1	236 27 58	56 28 13	Louisiana 1	2,686.5
	286 58 10	106 58 55	Louisiana 3	7,875.5
	338 15 49	158 16 04	Texas 2	6,566.5
	245 17 30	....	Light-house	....
	115 36 50	....	Church spire	....
	135 58 35	....	Railroad depot	....
	3 10 52	183 10 47	Texas 4	12,824.3
Louisiana 1	305 33 13	125 33 43	Louisiana 3	6,506.0
	358 33 00	178 33 00	Texas 2	7,586.1
	272 40 14	....	Light-house	....
	94 09 35	....	Church spire	....
	106 32 00	....	Railroad depot	....
Texas 2	233 18 38	53 19 08	Louisiana 3	6,361.4
	322 30 32	142 31 17	Red beacon	12,755.5
	25 07 01	205 06 41	Texas 4	7,405.2
	185 19 25	....	Light-house	....
	144 31 50	....	Sabine hotel	....
	149 37 03	....	Railroad depot	....
Texas 4	287 23 10	107 24 15	Red beacon	11,429.4
	257 29 20	....	Wreck Clifton	....
	195 06 40	....	Light-house	....
	172 05 10	....	Railroad depot	....
	168 33 50	....	Sabine hotel	....
	167 15 20	....	Church spire	....
Louisiana 3	349 10 55	169 11 10	Red beacon	14,174.0
	38 08 02	218 07 12	Texas 4	13,354.5
	130 23 38	....	Light-house	....
	113 47 43	....	Sabine hotel	....
	4 49 10	....	Wreck Clifton	....
Red Beacon	145 44 37	....	Railroad depot	....
	146 10 20	....	Wreck Clifton	....
	158 13 37	....	Light-house	....

Description of harbor lines, Sabine Pass, Texas, approved by the Secretary of War August 12, 1903.

[NOTE.—Azimuths referred to true meridian.]

WEST HARBOR LINE.

From—	To—	Azimuth.	Distance.
		° ′ ″	*Feet.*
[a]O	A	152 01 36	6,618.2
A	B	147 23 20	6,000.0
B	C	132 23 40	1,350.0
C	D	142 03 00	1,500.0
D	E	161 51 20	2,625.0
E	P	130 11 00	822.4
P	Q	111 24 20	2,555.4
Q	R	93 41 00	1,094.6
R	S	120 08 40	2,104.7
S	T	146 52 40	2,296.3
T	U	171 41 20	3,200.0

Description of harbor lines, Sabine Pass, Texas, etc.—Continued.

EAST HARBOR LINE.

A′	B′	141 04 15	5,930.87
B′	C′	147 23 20	3,870.00
C′	D′	180 00 00	2,775.00
D′	E′	150 40 40	2,952.00
E′	F′	130 58 00	3,600.00
F′	G′	111 24 20	6,925.00
G′	H′	146 52 40	1,375.00
H′	I′	171 41 20	2,860.00

[a] Galvanized-iron pipe placed in west jetty.

Table of azimuths and distances. From iron pipes marking the angles of the shore reference line to the angles of the west harbor line and to prominent objects in the vicinity.

[NOTE.—All azimuths are referred to true meridian.]

From—	To—	Azimuth.	Distance.
		° ′ ″	*Feet.*
Harbor line point O (on west jetty).	Texas 2	120 56 40	3,225.3
	Angle A, harbor line	152 01 36	6,618.2
	Sabine Pass light-house	167 20 40	....
	Louisiana 3	203 08 00	....
	Red beacon	329 25 40	....
Reference point A	Texas 2	342 02 44	3,833.3
	Angle A, harbor line	237 23 20	1,001.5
	Reference point B	147 23 20	6,000.0
	Sabine Pass light-house	205 48 20	....
Reference point B	Angle B, harbor line	237 23 20	1,001.5
	Reference point C	132 23 40	1,091.0
	Church spire, Sabine	72 18 40	....
	Sabine light-house	282 42 50	....
	Texas 1	322 40 00	....
Reference point C	Angle C, harbor line	222 23 40	966.9
	Reference point D	142 03 00	1,662.2
	Texas 1	320 05 20	....
	U. S. engineer office flagstaff	232 11 20	....
Reference point D	Angle D, harbor line	232 03 00	953.2
	Reference point E	161 51 20	2,948.0
	Sabine light-house	294 45 00	....
	Flagstaff, Windsor Hotel	1 16 00	....
	Baptist Church spire, Sabine Pass	117 24 30	....
Reference point E	Angle E, harbor line	251 51 20	896.8
	Fort Dowling	251 32 00	511.7
	Reference point P	130 11 00	351.5
	Baptist Church spire, Sabine Pass	95 18 30	....
	Sabine Pass light-house	307 23 10	....
Reference point P	Angle P, harbor line	220 11 00	763.3
	Reference point Q	111 24 20	2,309.7
	Baptist Church spire, Sabine Pass	93 04 50	....
	Fort Dowling	274 54 20	....
	Flagstaff, Windsor Hotel	347 00 25	....
Reference point Q	Angle Q, harbor line	201 24 20	722.6
	Reference point R	93 41 00	874.6
	Baptist Church spire, Sabine Pass	79 30 30	....
	Junkerville	253 06 20	....
	Fort Dowling	287 21 10	....
Reference point R	Angle R, harbor line	183 41 00	688.3
	Reference point S	120 08 40	2,411.4
	Fort Dowling	284 17 30	....
	Sabine Pass light-house	302 33 40	....
	Baptist Church spire, Sabine Pass	74 02 00	....
Reference point S	Angle S, harbor line	210 08 40	616.2
	Old Town	158 41 05	869.3
	Reference point T	146 52 40	2,573.5
	Window gable of house	34 08 50	....
	Sabine Pass light-house	302 10 40	....
Reference point T	Angle T, harbor line	236 52 40	550.4
	Reference point U	171 41 20	3,430.9
	Mesquite Point	171 09 40	....
	Old Town	321 00 40	....
	Baptist Church spire, Sabine Pass	341 40 00	....
Reference point U	Angle U, harbor line	261 41 20	499.6
	Mesquite Point	170 43 20	....
	Pat Glennons Bayou	221 31 25	....
	Sabine Pass light-house	312 31 00	....
	Old Town	341 29 50	....
	Baptist Church spire, Sabine Pass	346 09 40	....

DESCRIPTIONS AND ELEVATIONS OF BENCH MARKS, SABINE, TEX., TO MOUTH OF NECHES RIVER, TEXAS. FROM DUPLICATE LINE OF LEVELS RUN IN NOVEMBER, 1903.

[NOTE.—Elevations are expressed in feet above zero of gauge at Sabine, Tex., which is mean low Gulf level.]

Reference point B.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point B. Elevation, 7.940 feet.

△ *Texas 1.*—Top of 3-inch galvanized-iron pipe marking triangulation station Texas 1. Elevation, 4.293 feet.

Reference point A.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point A. Elevation, 3.838 feet.

△ *Texas 2.*—Top of 3-inch galvanized-iron pipe marking triangulation station Texas 2. Elevation, 4.168 feet.

B. M. 1.—Top of iron rod, 1½ inches in diameter, embedded in ground at southeast corner of United States Engineer Office, Sabine, Tex. Elevation, 9.717 feet.

Reference point C.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point C. Elevation, 7.002 feet.

Reference point D.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point D. Elevation, 6.982 feet.

Reference point E.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point E. Elevation, 5.885 feet.

△ *Fort Dowling.*—Top of 3-inch galvanized-iron pipe marking triangulation station "Fort Dowling." Elevation, 6.735 feet.

Reference point P.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point P. Elevation, 5.188 feet.

Reference point Q.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point Q. Elevation, 4.290 feet.

Reference point R.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point R. Elevation, 4.652 feet.

Reference point S.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point S. Elevation, 4.122 feet.

△ *Old Town.*—Top of 3-inch galvanized-iron pipe marking triangulation station "Old Town." Elevation, 2.827 feet.

Reference point T.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point T. Elevation, 3.892 feet.

Reference point U.—Top of 3-inch galvanized-iron pipe marking west harbor line reference point U. Elevation, 8.077 feet.

T. B. M. Canal.—Top of oak hub driven near post of signboard at the lower end of Port Arthur Canal. T. B. M. is about 20 feet from bank of canal and about 1 foot from signpost. Elevation, 3.180 feet.

△ *Mesquite Point.*—Top of 3-inch galvanized-iron pipe marking triangulation station "Mesquite Point." Elevation, 4.542 feet.

T. B. M. 1.—Top of square-headed driftbolt through sill into pile. It is at east end of north bent of 150-foot trestle numbered 3E on line of S. P. R. R. The driftbolt is directly under the signboard at northeast corner of trestle. A 6-inch square is cut around the driftbolt. Trestle is about three-fourths of a mile above Old Town. Elevation, 3.995 feet.

T. B. M. 2.—Top of square-headed driftbolt through sill into pile, forming part of northernmost bent of 150-foot trestle known as 3F on line of Southern Pacific Railroad. T. B. M. is at east end of sill and is marked with the following letters: T. B. M. About 90 feet to the northeast of trestle stands the 3-mile post. Elevation, 4.095 feet.

T. B. M. 4.—Top of square-headed driftbolt in sill of northernmost bent of 150-foot trestle designated as 5A on line of Southern Pacific Railroad. T. B. M. is at east end of sill and about 100 feet south of Sander's road crossing and is marked thus: T. B. M. Elevation, 4.616 feet.

T. B. M. 5.—Top of square-headed driftbolt driven in sill placed on piling in northernmost bent of trestle 5C on Southern Pacific Railroad. T. B. M. is at east end of sill and marked thus: T. B. M. Trestle is about 1,000 feet south of 5-mile post. Elevation, 4.204 feet.

T. B. M. 6.—Top of driftbolt driven into sill at north end of trestle 6A on line of Southern Pacific Railroad. T. B. M. is in east end of sill, is about 1.8 feet lower than track elevation, and marked thus: T. B. M. The head of the bolt is missing. Elevation, 4.139 feet.

T. B. M. 7.—Top of driftbolt driven into cap of the sixth bent from north end of trestle across Keith Lake Gully, on line of Southern Pacific Railroad. T. B. M. is about 1.9 feet below top of rail and marked thus: T. B. M. Elevation, 4.884 feet.

T. B. M. 8.—Head of wire nail driven flush in east end of cap of northernmost bent in trestle 7A on line of Southern Pacific Railroad. The T. B. M. is marked with copper tacks thus: T. B. M., and is between the letters T. and B. Elevation, 3.919 feet.

△ *Round Lake.*—Top of 3-inch galvanized-iron pipe marking triangulation station "Round Lake." Elevation, 2.744 feet.

T. B. M. 9.—Top of driftbolt driven in east end of cap of northernmost bent in trestle designated as 8A on line of Southern Pacific Railroad. Elevation, 4.216 feet.

T. B. M. 10.—T. B. M. is top of driftbolt in east end of cap of northernmost bent in trestle 9A on line of Southern Pacific Railroad. Bolt projects about two-tenths above surface of cap and has no head. Elevation, 4.539 feet.

T. B. M. 11.—Top of square-headed driftbolt driven in east end of cap of northernmost bent of trestle 10A on line of Southern Pacific Railroad. Marked T. B. M. with copper tacks. Elevation, 4.129 feet.

T. B. M. 12.—Top of driftbolt driven in east end of northernmost bent of trestle on line of Southern Pacific Railroad, opposite Colonia Refinery. Marked: T. B. M. Elevation, 4.976 feet.

T. B. M. 13.—Head of 20d. boat spike in telephone pole, 30 feet from northwest corner of Port Arthur rice mill warehouse. T. B. M. is 2 feet from ground. Elevation, 4.261 feet.

B. M. elevator.—Northeast corner of capping stone in foundation, northeast corner of Port Arthur grain elevator. No marks. Elevation, 6.918 feet.

B. M. depot.—Top of cast-iron shoulder at east end of south doorsill of middle waiting room of Kansas City Southern Railroad depot at Port Arthur, Tex. B. M. is marked by cross. Elevation, 7.075 feet.

B. M. bank.—Top of shoulder in east corner of iron doorstep of the First National Bank of Port Arthur, Tex. The shoulder is about three-fourths inch higher than the corrugated surface of the step, and measures about 2 inches east and west and 1¼ inches north and south, with a beveled surface sloping to outer edge of doorstep. Coordinates of B. M. are 16.1 feet to edge of curb on Proctor street and 17.5 feet to edge of curb on Austin avenue. Elevation, 6.340 feet.

T. B. M. 15.—Top of eyebolt placed in south stone gatepost of Stearn's residence, Proctor avenue. The B. M. is 3.4 feet above the cement pavement of carriage roadway and is apout 40 feet west of northwest corner of stable. Elevation, 7.665 feet.

B. M. lake shore.—Top of 1½-inch galvanized-iron pipe set in cement 4 feet north of a fence line running about northwest and which begins at shore of lake. T. B. M. is about 25 feet from lake shore, stands 18 inches above ground surface, and is about 1½ miles north of point where Beaumont road turns to the left from Proctor avenue. Elevation, 4.495 feet.

△ *Neches.*—Top of 3-inch galvanized-iron pipe marking triangulation station Neches. Elevation, 4.220 feet.

T 10.

PRELIMINARY EXAMINATION OF BAYOU GROSSETETE, LOUISIANA.

[Printed in House Doc. No. 245, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 4, 1903.

Sir: I have the honor to submit herewith, for transmission to Congress, report dated September 20, 1902, by Lieut. Col. H. M. Adams, Corps of Engineers, on preliminary examination of Bayou Grossetete, Louisiana, authorized by the river and harbor act approved June 13, 1902.

This report has been referred for consideration by the Board of

Engineers for Rivers and Harbors, as provided in sections 3 and 14 of said act, and attention is respectfully invited to the Board's report of March 6, 1903, in second indorsement thereon.

Bayou Grossetete is a small stream tributary to Bayou Plaquemine, and is regarded as navigable for a distance of about 30 miles. There is no commerce on the bayou at present other than the handling of logs or timber by small craft at times of high water, and there are four bridges which would be serious obstructions to any navigation.

For these reasons Lieutenant-Colonel Adams states that in his opinion the locality is not worthy of improvement. The Board of Engineers for Rivers and Harbors reports that it is not advisable for the United States to undertake the improvement at this time, and in this opinion I concur.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS.

United States Engineer Office,
New Orleans, La., September 20, 1902.

General: Complying with Department letters dated June 23 and July 19, 1902, I have the honor to report upon the preliminary examination of Bayou Grossetete, Louisiana, called for by act of Congress approved June 13, 1902.

That portion of Bayou Grossetete considered navigable extends from its junction with Bayou Plaquemine at Indian Village, to Livonia, parish of Pointe Coupee, a distance of about 30 miles. A preliminary examination of this bayou was made in 1897 by Maj. James B. Quinn, who reported it worthy of improvement. This report was concurred in by Colonel Barlow, division engineer, with the proviso that the obstructing bridges be properly modified by their owners, so as to render them unobstructive to navigation.

An examination of Bayou Grossetete has just been made by Mr. J. I. Conklin, superintendent. Copy of his report is herewith.

There is no commerce on this bayou at present other than the handling of logs or timber by small craft at times of high water. The four bridges referred to are serious obstructions to navigation, and while they exist it is thought unwise to consider the question of the improvement of the stream.

In my opinion the bayou is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

H. M. Adams,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 24, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C, March 6, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer and that of the superintendent.

The commerce involved is not large. The river is now navigable for small crafts at moderate stages, but is crossed by certain bridges which are serious obstructions. In the opinion of the Board it is not advisable for the United States to undertake the improvement of Bayou Grossetete, at least so long as the bridges remain in their present condition.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. J. I. CONKLIN, SUPERINTENDENT.

UNITED STATES ENGINEER OFFICE,
Plaquemine, La., September 18, 1902.

SIR: I have the honor to submit the following report on preliminary examination of Bayou Grossetete, Louisiana:

The navigable part of Grossetete reaches from Livonia, in the parish of Pointe Coupee, to Indian Village, Bayou Plaquemine, a distance of about 30 miles.

The land bordering Grossetete on the lower end is low, being about 8 feet above low water at the mouth; the land grows gradually higher as the stream is ascended, until at Livonia it is from 20 to 25 feet above low water. The lower end, known as Grossetete Bay for a distance of 2 miles from Bayou Plaquemine, is a stream about 300 feet wide, with an average depth of 15 to 20 feet, the only obstruction in this portion being snags and sinkers.

From the mouth of Grossetete at its junction with the bay for a distance of about 3 miles the bayou narrows to about 75 to 100 feet, and is obstructed by overhanging trees and drift over which sand bars have formed; these bars go almost dry in low water.

After these bars are past the principal obstructions are stumps, which are prevalent over a large extent of the bayou. The depth of the stream above the bars is varying, from 3½ to 10 feet.

A number of bridges have been erected over the stream, which are nearly all in bad condition and would have to be removed.

The first one is known as Young's bridge; the opening is about 50 feet and the draw rests on pontons. The whole structure is rotten and shaky.

The Texas and Pacific has recently erected a plate-girder drawspan at Grossetete station. This bridge crosses the bayou obliquely and has a clear opening of 60 feet. It is, however, operated with difficulty, and one whole day was consumed during preliminary examination waiting for this bridge to be opened.

At Rosedale is another flimsy trestle which requires a gang of men a day to open; at this point an effort is being made to have the parish erect a new drawspan. At the Barrow plantation, about 6 miles above Rosedale, is another bridge which will have to be removed.

During the high water caused by the breaking of the Morganza levee the country bordering Bayou Grossetete was overflowed and the country was largely abandoned. Since the Morganza levee has been rebuilt and strengthened, confidence has been restored and the land is being rapidly reclaimed, and the country on each side of the bayou is becoming densely settled. The land is very productive and the crops are as good as in any portion of the State.

The only outlet now is by the Texas and Pacific Railroad, and the rates are very high. There were shipped from stations bordering Grossetete last year 17,500 bales of cotton, 8,000 tons of cotton seed, 40,000 tons of sugar-cane products; and there came from the bayou about 20,000,000 feet of timber. Merchandise sent in, about $250,000; fuel sent in, about $50,000.

There are at present no boats making trips in this bayou except those of very light draft, pulling timber, which is floated over the bars during high water or freshets.

If the bayou was improved it would give the inhabitants all along Grossetete the benefits of water transportation for shipments and receipts, and, as the bayou connects with Bayou Plaquemine, the produce and supplies could have direct outlet to any portion of the country.

It is safe to predict a very great increase of produce from this rapidly developing district.

I regard the bayou as worthy of improvement, and would recommend that a survey of the route be made from Bayou Plaquemine to Livonia to estimate the cost of a channel 60 feet wide and 6 feet in depth.

Estimated cost of survey, $4,500.

Very respectfully, your obedient servant,

J. I. Conklin,
Superintendent.

Lieut. Col. H. M. Adams,
Corps of Engineers.

T II.

PRELIMINARY EXAMINATION AND SURVEY FOR SHIP CHANNEL FROM BEAUMONT, ON NECHES RIVER, AND ORANGE, ON SABINE RIVER, TO SABINE LAKE, THENCE ALONG THE WEST SIDE OF THE LAKE TO SABINE PASS, TEXAS, INCLUDING A CONNECTION BETWEEN SAID CHANNEL AND THE PORT ARTHUR CANAL.

[Printed in House Doc. No. 634, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, March 22, 1904.

Sir: I have the honor to submit herewith for transmission to Congress reports on preliminary examination and survey made under authority conferred by an item in the river and harbor act approved June 13, 1902, as follows:

> Ship channel from Beaumont and Orange, on the Sabine and Neches rivers, to Sabine Pass on the west side of said lake, at or near the margin of said lake, with a view to excavating a channel of a depth of nine, twelve, eighteen, and twenty-five feet, and as to the practicability and feasibility of connecting the channel proposed above with the channel or canal now known as the Port Arthur Canal, extending from Sabine Pass to Port Arthur, and as to other matters touching the construction, excavating, and desirability of the channel herein proposed which may be deemed worthy or material, and as to such other facts in connection with the construction of said canal as the Secretary of War may deem proper.

As a result of the preliminary examination, the officer then in local charge, Lieut. Col. H. M. Adams, Corps of Engineers, expressed the opinion in report thereon, dated October 21, 1902, that the locality in question is not worthy of improvement by the General Government to a greater extent than that contemplated by a project adopted by the said act of June 13, 1902, which provided for a channel 8 feet deep and 150 feet wide between the same terminal points mentioned above, but through Sabine Lake instead of at or near the margin of the lake on the west side.

This report was referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and in its report[a] of August 5, 1903, the opinion was expressed that it is both practicable and feasible to construct a channel of any of the depths named in the act and to connect the same with the Port Arthur Canal, but that such connection should not be made until the free use of the canal is assured; that the commerce involved, present and prospective, will be sufficiently served by the construction of a channel 9 feet deep; that such channel would be of the greatest service if located on the west shore of the lake, and that it is advisable that the United States undertake such improvement, provided it can be effected at a reasonable cost.

Upon the recommendation of this Office the Secretary of War authorized the survey necessary to prepare a project and estimate of cost for a 9-foot channel as proposed, and reports thereon by the local officer, Capt. Charles S. Bromwell, Corps of Engineers, submitted under date of December 12, 1903, and February 13, 1904, are herewith. In these reports various routes for such 9-foot channel are considered, all at or near the margin of Sabine Lake on the west side, and estimates ranging from $382,000 to $747,000 are presented as the probable first cost, in connection with which should be considered an annual allowance for maintenance after completion. The plan and estimate recommended by Captain Bromwell is that requiring an initial expenditure of $464,000, and in his opinion this work is worthy of being undertaken by the United States with a view to the needs of prospective rather than present commerce.

In passing upon these projects and estimates as division engineer, Lieut. Col. H. M. Adams adheres to his former opinion in favor of the authorized project for a channel of 8 feet depth through Sabine Lake.

After a final review of all the facts presented the Board of Engineers for Rivers and Harbors expresses the opinion in its report[b] of March

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[a] See page 1939.

[b] See page 1949.

1, 1904, that the channel best suited to present commercial conditions, best adapted to future development, and most easily maintained is the 9-foot channel described in Captain Bromwell's report of February 13, 1904, and estimated to cost $536,500, with $30,000 annually after completion for maintenance, and possible further expenditures for a guard lock. In the opinion of the Board it is advisable for the United States to undertake the construction of such a channel, conditional, however, upon the transfer to the United States of the Port Arthur Canal free of cost, upon the transfer to the United States of a free right of way for the remainder of the waterway, and upon provision being made by Congress for the early completion of the work under the continuing-contract system.

In this connection it is proper to invite attention to the action of the Department in regard to the regularly authorized project for this locality as adopted by said act of June 13, 1902, and referred to above. The item of the act reads as follows:

> Improving mouths of Sabine and Neches rivers, Texas, in accordance with House Document Numbered Two hundred and ninety-nine, Fifty-fourth Congress, second session, by connecting the same with Sabine Pass by a channel eight feet deep through Sabine Lake: Continuing improvement, one hundred and twenty-five thousand dollars: *Provided further*, That in the discretion of the Secretary of War he may select a route at or near the west shore of said lake, and said channel may be connected with Port Arthur Canal: *Provided further*, That, in case such connection is made, boats shall be allowed to pass through the said canal without payment of any tolls.
>
> In case funds shall be furnished by the citizens of Orange and Beaumont or in any other way to secure a channel along the route herein described of a greater depth than eight feet, the amount herein appropriated may be expended in securing a greater depth than herein designated.

The plan thus adopted was for a channel 8 feet deep "through Sabine Lake," with the provision that the Secretary of War might select a route "at or near the west shore of said lake," if boats should be allowed free use of the Port Arthur Canal, and that a greater depth than 8 feet might be obtained, provided the necessary funds were furnished by the citizens of Orange and Beaumont.

The free use of the Port Arthur Canal was not granted by the owners, nor did the citizens of Orange and Beaumont offer to furnish funds to secure a greater channel depth; consequently, by the terms of the act, the Department was restricted in its operations to the 8-foot channel through Sabine Lake. It appearing, however, that the route at or near the west shore was preferred by the interests most directly affected, the Secretary of War, under date of November 6, 1902, approved the recommendation of this Office, that the work on this improvement be not undertaken for the time being, in order that the matter might receive the further consideration of Congress.

A bill is before Congress at its present session, and at this date has passed the House of Representatives, to make the sum already appropriated available for a channel "at or near the west shore of Sabine Lake," without conditions as to right of way or as to the cession to the United States of the Port Arthur Canal. For this reason, and because I believe that the conditions requiring donation of the right of way for a channel lying shoreward of the present western shore line might result in still further delaying the beginning of this work, I do not recommend attaching to this project, if it be adopted by Congress, the conditions as to right of way and free cession of the Port Arthur

Canal recommended by the Board of Engineers for Rivers and Harbors, nor fixing definitely the location of the channel, which would be sufficiently described by the words used in the draft of the bill now pending.

Very respectfully, your obedient servant,

A. MACKENZIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. WM. H. TAFT,
Secretary of War.

PRELIMINARY EXAMINATION FOR SHIP CHANNEL FROM BEAUMONT, ON NECHES RIVER, AND ORANGE, ON SABINE RIVER, TO SABINE LAKE, THENCE ALONG THE WEST SIDE OF THE LAKE TO SABINE PASS, TEXAS, INCLUDING A CONNECTION BETWEEN SAID CHANNEL AND THE PORT ARTHUR CANAL.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., October 21, 1902.

GENERAL: 1. In compliance with Department letters dated June 23 and July 19, 1902, I have the honor to report upon the preliminary examination of—

> Ship channel from Beaumont and Orange, on the Sabine and Neches rivers, to Sabine Pass, on the west side of said lake, at or near the margin of said lake, with a view to excavating a channel of a depth of nine, twelve, eighteen, and twenty-five feet, and as to the practicability and feasibility of connecting the channel proposed above with the channel or canal now known as the Port Arthur Canal, extending from Sabine Pass to Port Arthur, and as to other matters touching the construction, excavating, and desirability of the channel herein proposed which may be deemed worthy or material, and as to such other facts in connection with the construction of said canal as the Secretary of War may deem proper—

called for by river and harbor act approved June 13, 1902.

2. Sabine and Neches rivers both empty into Sabine Lake, Texas, the Sabine at the head or upper end of the lake, the Neches 3 miles below, on the west side. Prior to any improvement there was 3½ feet of water on the bar at the mouth of the Sabine River and 3 feet on the bar at the mouth of the Neches. Dredging was carried on at the mouth of the Sabine River in 1880 and 1895, and a channel 60 feet wide and 7 feet deep was secured. At the mouth of the Neches dredging was carried on in 1880, 1889, and 1895, and a channel 50 feet wide, 5 feet deep, and 8,000 feet long was obtained. In 1897 the channel at the mouth of the Sabine still carried a depth of 7 feet, while the channel at the mouth of the Neches had shoaled to 4 feet.

3. A project approved July 14, 1899, provided for dredging from deep water in the Neches River to deep water in Sabine Lake. Under this project an 8-foot channel 7,829 feet long was dredged from the 7-foot contour in Neches River to the 6-foot contour in Sabine Lake, a small part of the appropriation being expended in deepening the channel across the bar at the mouth of Sabine River. The available depths on June 30, 1901, were 6½ feet into the Sabine and 4½ feet into the Neches. The act of March 3, 1899, provided for a reexamination of the proposed channel through Lake Sabine by a Board of Engineer

officers. A report of the Board is printed in House Document No. 100, Fifty-sixth Congress, first session, and on page 2302, Annual Report for 1900. The Board recommended a 9-foot channel on the east side of the lake at an estimated cost of $300,000. The Board also recommended the construction of a dredge at a cost of $100,000 and an annual appropriation of $50,000 for maintenance of channel.

4. Appropriations for improving mouths of Sabine and Neches rivers have been made as follows:

By act of Congress approved March 3, 1899	$10,000
By act of Congress approved June 13, 1902	125,000
Total	135,000

5. The greater part of the commerce on the Neches and Sabine rivers is of a local character, the principal articles being shells and sand dredged from the banks or bed of the river near by and transported entirely within the river where there is deep water and no improvement is needed.

6. The act approved June 13, 1902, contains the following provision:

> Improving mouths of Sabine and Neches rivers, Texas, in accordance with House Document Numbered Two hundred and ninety-nine, Fifty-fourth Congress, second session, by connecting the same with Sabine Pass by a channel eight feet deep through Sabine Lake: Continuing improvement, one hundred and twenty-five thousand dollars: *Provided further*, That in the discretion of the Secretary of War he may select a route at or near the west shore of said lake, and said channel may be connected with Port Arthur Canal: *Provided further*, That, in case such connection is made, boats shall be allowed to pass through the said canal without payment of any tolls.
>
> In case funds shall be furnished by the citizens of Orange and Beaumont or in any other way to secure a channel along the route herein described of a greater depth than eight feet, the amount herein appropriated may be expended in securing a greater depth than herein designated.

7. At the outset it was necessary to determine the following questions:

First. If permission would be granted by the Port Arthur Canal and Dock Company to connect "said channel" with Port Arthur Canal, and to use said canal as provided in the act.

Second. The amount of the funds which "the citizens of Orange and Beaumont" would furnish, or the amount which would be furnished "in any other way to secure the channel along the route herein described," etc.

8. After correspondence with parties both directly and indirectly interested in the improvement, and after a consultation with citizens of Beaumont and Orange, I have to say that the Port Arthur Canal and Dock Company has not authorized a connection to be made with Port Arthur Canal by any channel which the United States may secure; also, that "the citizens of Orange and Beaumont" have not offered to furnish funds to be used in securing a channel either of 8 feet or greater depth, and I have no knowledge that funds, in addition to the amount appropriated, will be furnished "in any other way."

9. We have therefore only to consider the amount appropriated ($125,000) by act of June 13, 1902, and the estimate for an 8-foot channel printed in House Document No. 299, Fifty-fourth Congress, second session.

10. In 1895 the Sabine River bar was dredged, and in 1897 it was found that the cut had maintained very well. While it is expected that a dredged channel in Sabine Lake will fill up during violent

storms, yet it is the only project that may be executed for what could be considered a reasonable expenditure.

11. The cost of securing a channel of greater depth than 8 feet would be greater than the requirements of commerce appear to warrant, and the cost of securing an adequate channel of that depth will be in excess of the amount appropriated.

12. It is proposed to secure a channel, by dredging, which shall be 8 feet in depth at mean low water, with a bottom width of 150 feet, said channel to run from the head of Sabine Pass to Neches River, thence to Sabine River.

13. The dredging to be done in the following order:

First. The bar at the mouth of Neches River.
Second. The bar (Blue Buck bar) at the head of Sabine Pass.
Third. The bar at the mouth of Sabine River.
Fourth. To expend the balance which may remain in dredging a channel from Neches River to Sabine Pass and Sabine River.

14. It was estimated that 1,500,000 cubic yards of material must be removed to secure said channels and, at 10 cents per cubic yard, the cost would be $150,000. Of this amount $125,000 was appropriated by the last river and harbor act.

15. A careful examination of the proposed canal route has just been made by Mr. A. H. Weber, assistant engineer. His report is complete and in detail. It includes commercial statistics and general information thought worthy or material, and is herewith.

16. I agree with Mr. Weber in his conclusions, and, in my opinion, this locality is not worthy of improvement by the General Government to a greater extent than that contemplated by the project adopted by Congress—i. e., for an 8-foot channel, 150 feet wide, through Sabine Lake.

Very respectfully, your obedient servant,

H. M. ADAMS,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
November 11, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 11, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination for ship channel on the west side of Sabine Lake from Beaumont and Orange, on the Sabine and Neches rivers, to Sabine Pass, Tex., authorized by the river and harbor act approved June 13, 1902, with a view to securing a channel with depths of 9, 12, 18, and 25 feet.

In a report of the 5th ultimo on the subject (copy herewith) the Board of Engineers for Rivers and Harbors expresses the opinion that it is advisable for the United States to undertake the work of excavating such a channel with a depth of 9 feet, provided it can be effected at a reasonable cost.

I concur in this opinion and recommend that a survey necessary to prepare a project and estimate of cost of such improvement be authorized, the expenses of such survey to be paid from the appropriation for examinations, surveys, and contingencies of rivers and harbors, act of June 13, 1902.

Certain papers in this case are now in the hands of the Attorney-General with request from the War Department for an opinion on a point incidentally involved in a full consideration of the merits of this proposed improvement, but a project and estimate as herein contemplated are essential to such consideration and final recommendation by this Department, regardless of the question to be determined by the decision of the Department of Justice.

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

[Fourth indorsement.]

War Department,
September 15, 1903.

Approved, as recommended by the Chief of Engineers.

Robert Shaw Oliver,
Acting Secretary of War.

[Eleventh indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, February 25, 1904.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with estimates, as requested.

By command of Brig. Gen. Mackenzie:

H. F. Hodges,
Major, Corps of Engineers.

REPORT OF MR. A. H. WEBER, ASSISTANT ENGINEER.

United States Engineer Office,
New Orleans, La., October 18, 1902.

Colonel: I have the honor to submit the following report upon an examination of the proposed ship channel from Beaumont and Orange to Sabine Pass made in compliance with instructions contained in your letter of September 27, 1902.

In a report[a] upon the Sabine River, submitted by the writer under date of September 27, 1902, the physical characteristics and commercial statistics of that stream were given, and it is not thought necessary to repeat them in this report, which will treat particularly of the Neches River and such general information and data as is deemed worthy and material and bearing upon the project as a whole.

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[a] Printed in House Document No. 177, Fifty-eighth Congress, second session.

The examination was made October 1–9, 1902, the U. S. launch *Transit*, of Sabine, being used for the trip from Beaumont to Sabine Pass, via Neches River, Sabine Lake, Port Arthur Canal, and Sabine Pass. Taylors Bayou was also examined for a distance of about 1 mile from its mouth.

The stage of water in the Neches was about 1½ feet above extreme low water, and 1 foot above in the lake.

The principal distances to be considered in connection with this subject are:

	Miles.
Beaumont to mouth of Neches	25
Orange to mouth of Sabine	10
Mouth of Sabine to mouth of Neches	4
Mouth of Neches to Port Arthur	8
Mouth of Neches to mouth of Taylors Bayou	11
Mouth of Taylors Bayou to head of canal	½
Head to foot of canal	7
Foot of canal to Sabine	3

Description of river.—The right bank of the river at Beaumont is about 15 feet and the left bank about 3 feet above low water. Proceeding downstream a few miles the right bank lowers to about 4 feet, and from this locality to the mouth of the river, with the exception of two places known as Smiths and Griggs bluffs, the banks are but 1 to 3 feet above low water and are subject to overflow.

The bluffs referred to above are 8 to 16 feet above low water (the word "bluff" being a misnomer). The Port Arthur Rice and Irrigating Company's pumping plant is located on Smiths Bluff, 10 miles above the mouth of the river, and the Central Asphalt and Refining Company have recently established an extensive plant for the treatment of petroleum on Griggs Bluff, 7 miles above the mouth.

For about 8 miles below Beaumont the banks are heavily wooded, and for the rest of the distance the country is open and covered with grass where the elevation is 1½ feet or more above low water, and with sea cane where it is lower.

The range in stage from high to low water is about 10 feet at Beaumont and 5 feet at Griggs Bluff, from which point it diminishes gradually to the mouth. High water usually occurs between December and April.

The width of the river is 400 feet at Beaumont, increasing to 1,000 feet at the mouth.

The depth varies from a minimum of 16 feet to 42 feet. It is thought that 20 feet of water may be found for three-fourths of the total distance between Beaumont and the mouth of the river. After entering the lake there is a staked channel, which was dredged in 1900 to a depth of 8 feet for a distance of about 1½ miles. This depth still obtains for a distance of about 1 mile, after which it decreases to 6 feet, which is about the average depth of the lake in this vicinity. The stage in the lake was estimated at 1 foot above ordinary low water.

The current in the river is scarcely noticeable at low water, but increases perceptibly with the stage, and at high water it is with difficulty a skiff can stem it.

Salt water has been noticed on several occasions above Beaumont and for from one to four days of each year at Smiths Bluff, 10 miles above the mouth. During the period of salt water, pumping at the irrigation plants must be discontinued, as the effect of the salt on the rice crop is very injurious. No serious results, however, have been experienced from this source on the Neches, owing to the short duration of the salt-water period, but on Taylors and Hildebrants bayous the loss to the rice producers from salt water has been heavy.

This subject will be referred to again, it being deemed worthy or material.

Commerce.—The principal articles of commerce are shells, sand, lumber, oil, and building materials. The lumber and oil are carried out of the Neches and through the lake, the greater part of the other items being handled entirely within the river. The shells are obtained from natural deposits about 1 mile above the mouth of the river. They are barged to Beaumont and used for street paving and for concrete. The sand is dredged from the bed of the river either above or below Beaumont and is also barged to the city and is used in general construction. Beaumont is in a very prosperous condition and a great deal of building material is being used.

The export lumber is either barged or floated to Port Arthur or Sabine and there loaded on vessels.

The oil industry is new and developing rapidly. The greater part of the output is piped to Port Arthur or Sabine and loaded on tank vessels. A small part is loaded on barges at Beaumont, where there are one or two pipe lines, and towed to Port Arthur or Sabine and transferred to larger vessels or towed directly to some near-by port. It is thought that this industry will materially increase in the future and would double or quadruple if there were better water through the lake.

The idea prevails at Beaumont that considerable rice is boated on the Neches, but no evidence of this fact could be secured.

Commercial statistics, Neches River, year ending October 1, 1902.

Article.	Tons.	Value.
Shells	108,000	$162,000
Sand	205,000	205,000
Timber	3,000	18,000
Brick	225	1,100
Cement and lime	75	1,000
Oil	3,100	9,300
Total	319,400	396,400

Number of steam vessels regularly employed	12
Number of barges regularly employed	60
Number of trips. (No records kept.)	

In addition to the number of vessels regularly employed, several have entered from the outside, no record of them having been kept.

Commercial statistics, Neches and Sabine rivers, combined.

[Neches River, year ending October 1, 1902. Sabine River, year ending December 31, 1901.]

Article.	Tons.	Value.
Shells	124,000	$178,000
Sand	206,000	206,500
Brick	1,225	6,100
Rice	7,500	150,000
Merchandise	825	23,500
Railroad steel	4,500	270,000
Lumber	18,721	111,736
Oil	3,100	9,300
Total	365,871	955,136

Number of vessels regularly employed	19
Number of barges regularly employed	70

Statement of tonnage and commerce passing through Sabine Pass jetties for calendar year ending December 31, 1901.

Steamers	number	39
Trips	do	675
Net registered tonnage (675 trips)	tons	225,110
Sailing vessels	number	88
Trips	do	124
Net registered tonnage (124 trips)	tons	185,758
Barges	number	13
Trips	do	102
Net registered tonnage (102 trips)	tons	69,478
Total vessels	number	137
Total trips	do	901
Total tonnage	tons	480,346

Draft of heaviest vessel: Light, 12 feet; loaded, 22.7 feet.

Shipments and receipts.

Article.	Tons.	Value.
SHIPMENTS.		
Lumber	63,276	$380,358
Merchandise	6,231	49,876
Cotton and cottonseed products	16,055	1,982,171
Wheat and corn, in bulk	12,625	312,165
Rice	434	5,494
Oil, in bulk	45,950	152,872
Total shipments	144,571	2,882,936
RECEIPTS.		
Merchandise	5,516	135,764
Total receipts	5,516	135,764
Grand total	150,087	3,018,700

Of the total shipments through Sabine Pass, the following came out of the Neches or Sabine, the balance having been shipped from Port Arthur or Sabine:

Article.	Tons.	Value.
Lumber	18,721	$111,736
Oil	3,100	9,300
Total	21,821	121,036

Oil.—The oil industry in the vicinity of Beaumont is the most important in this section, and is referred to by those interested in deep water as having great weight in connection with this subject. A few facts and figures are therefore deemed worthy. The age of "gushers" at Spindletop—the most remarkable oil field the world has ever known—is passed. Gradually in each of these artesian oil wells the pressure diminished as the gas confined by the cap rock escaped with the oil until one by one they ceased to flow and pumping had to be resorted to. This is now being done at each of the producing wells. The main output is piped to Port Arthur or Sabine and some of it to Beaumont and the two refining plants on the Neches. The oil is temporarily stored in large tanks located at various points along the several pipe lines, the greater number being at Port Arthur and vicinity.

There are now five lines of 6-inch pipe into Port Arthur and two into Sabine. The capacity of these lines depends upon the initial pressure exerted by the pumps, and information on this point could not be secured.

The cost of a pipe line is estimated at $5,000 per mile. The distance from Port Arthur to Beaumont is about 15 miles. It is reported that the life of a pipe line is expected to be very short, a few years only, as much of the distance is over low ground subject to overflow from salt or brackish water, which attacks and corrodes the iron.

The following tables of the shipments of oil, by months, give a good idea of the wonderful growth of this industry:

Coastwise shipments from Port Arthur.

	Quantity each month.	Total.
1901.	*Gallons.*	*Gallons.*
September	420,000	420,000
October	2,341,038	2,761,038
November	1,629,474	4,390,512
December	658,434	5,048,946
1902.		
January	1,755,518	6,808,464
February	3,331,398	10,135,862
March	3,146,485	13,282,347
April	1,065,036	14,347,383

Coastwise shipments from Port Arthur—Continued.

	Quantity each month.	Total.
1902.	*Gallons.*	*Gallons.*
May	4,444,431	18,791,814
June	4,073,599	22,865,413
July	10,000,824	32,866,237
August	11,903,666	44,769,903
September	10,481,862	55,251,765
Total	55,251,765	55,251,765
Foreign shipments		16,834,460
Total from Port Arthur		72,086,225

Coastwise shipments from Sabine.

	Quantity each month.	Total.
1901.	*Gallons.*	*Gallons.*
December	303,450	303,450
1902.		
January	504,000	807,450
February	491,400	1,298,850
March	936,600	2,235,450
April	3,933,678	6,169,128
May	3,535,098	9,704,226
June	3,954,762	13,658,988
July	3,160,418	16,819,406
August	9,218,235	26,037,641
September (estimated)	10,000,000	36,037,641
Total	36,037,641	36,037,641
Foreign shipments		2,605,050
Total from Sabine		38,642,691

Grand total from Sabine and Port Arthur, 110,728,916 gallons, or 2,636,400 barrels.

Tankage capacity, and quantity stored.

[Estimate made in June, 1902.]

Tanks.	Number.	Capacity.	Quantity stored.
		Barrels.	*Barrels.*
Iron	139	5,813,500	4,868,000
Earthen	20	4,225,000	438,000
Wooden	(?)	192,000	145,000
Total		10,230,500	5,451,000

A barrel of oil contains 42 gallons and weighs 310 pounds.

It will be noticed from the above that at the rate of shipment during the past year there is on hand sufficient oil to last two years, and at the rate reached during the months of August and September there is about ten months' supply. It is thought the present output exceeds the capacity, as a number of new tanks are under construction.

There are grave fears in the minds of many that the Spindletop district has seen its best days and that the output will soon begin to diminish, and perhaps entirely cease within the next few years. New fields, however, are being discovered within piping distance of Port Arthur and Sabine, and it is thought that these will supply the demand for many years. The impression gained from conversation with those interested in the exportation of oil on a large scale was that, as it had to be piped from the source of supply, they would do so in the main by way of Port Arthur or Sabine rather than to Beaumont, even though deep water were secured.

Rice.—Next in importance to the oil industry is the production of rice. This business was in its infancy in this section of the country but a few years ago, and it is now one of the greatest sources of revenue. There are 4 large irrigation plants on the Neches River, 12 on Taylors and Hildebrants bayous, and a number on Cow and Adams bayous, tributaries of the Sabine.

The acreage in rice in Jefferson County, watered from plants on the Neches River, Taylors and Hildebrants bayous, is now 35,000, with a probability of 48,000 next year. In Orange county, watered from Cow and Adams bayous, the acreage is 13,500, with the probability of 20,000 next year.

Product and value of the rice crop.

Year.	Jefferson County.		Orange County.	
	Sacks.	Value.	Sacks.	Value.
1902	374,000	$885,000	132,500	$331,250
1903	480,000	1,200,000	200,000	500,000

It is thought by many interested in the canal project that a large part of the rice crop would be moved by water if deep water were secured. I am not of that opinion. The manager of a large rice-milling plant in Beaumont, whose company is interested in rice culture on Taylors Bayou and owns a small boat and barges, stated that he made use of his floating plant to gather the rice from along the bayous and take it to the nearest railroad for shipment to Beaumont, but that he could not compete with the railroads in bringing it into Beaumont, either now or in the event of deep water being obtained, and that he did not believe his business would be affected one way or the other.

The vice-president and manager of a large irrigating plant located on the Neches and supplying water for 10,000 acres of rice land lying between the Neches River and Taylors Bayou informed me that he personally had 300 acres in rice, and naturally was interested in the development of this section of the country; that he thought a deep-water canal would in a general way be a good thing for the adjacent country, but that he did not believe it would affect his business in the least, and that his interest in the project would not extend to the point of subscribing a dollar if this were asked.

Of the rice growers interested in the deep-water channel, those on Taylors and Hildebrants bayous seem most concerned, the reason being that their crops are seriously damaged by salt water, and they believe that the existence of a canal on the west side of the lake will alleviate this evil. During the dry season when there is but little current in the bayou, and the tide and wind are shoreward, the waters of the bayou are backed up and encroached upon by those of the lake, which at these times are salt. This has occurred to a serious extent during the past two years, and the crops have been almost destroyed. The opinion exists among the planters that the construction of the Port Arthur Canal has materially enhanced this evil. Their theory is that the construction of the canal has transferred the mouth of Taylors Bayou from its original location, where it was supplied with fresh water carried down the west side of the lake from the Sabine and Neches rivers to the lower end of the canal, where it is easily fed with salt water from the pass, there being insufficient current in the canal to resist it.

It is the belief that if the canal were constructed, making connection with Taylors Bayou, it would keep the west side of the lake abundantly supplied with fresh water. It is possible that this belief may in a measure account for the strong feeling that exists in favor of having the proposed canal located close to or within the west shore line of the lake. The planters on Taylors and Hildebrants bayous recently pooled their interests and brought suit for damages against the Port Arthur Canal and Dock Company. During the early part of this month a meeting was held at Port Arthur between representatives of the canal company and the planters, at which an agreement of some sort was entered into, the terms of which were not made public, but it is thought an effort is to be made to secure aid from the General Government to construct a lock in the canal or Taylors Bayou with a view to preventing the salt water from entering.

From an engineering point of view a connection with the present Port Arthur Canal is practicable and feasible. There may be difficulties, however, in securing a right of way in the event of the selected route passing through private property. The opinion prevails with some that no opposition should be encountered from the Port Arthur Canal and Dock Company if connection is made with Taylors Bayou (a recognized navigable stream) and not with the canal direct, it being currently understood that the canal is a free waterway for any who desire to use it, and therefore it would not be within the power of the canal company to prevent its use by vessels bound toward or from a new canal. No evidence of fact bearing upon the absolute freedom of the canal was found. Should it be true that this is the case there would still be the possibility of legal questions arising bearing upon damages due to increased current, overflow, sediment, etc., as a result of introducing the waters of the Neches and Sabine rivers into Taylors Bayou and indirectly into the Port Arthur Canal.

Conclusions.—The Neches River below Beaumont and the Sabine River below Orange have ample depth and require no improvement to meet the present and prospective demands of commerce. There is not sufficient depth through the lake to meet the demands. This should be provided and maintained. A channel of 8 feet in depth and 150 feet in width will meet both present and future requirements. Such a channel has been provided for by recent act of Congress, and the locality is not worthy of improvement by the General Government beyond this extent.

Very respectfully, your obedient servant,

A. H. Weber,
Assistant Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers, U. S. A.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

Washington, D. C., *August 5, 1903.*

General: 1. The Board of Engineers for Rivers and Harbors has considered the report on the preliminary examination of the ship channel from Beaumont and Orange, on the Sabine and Neches rivers, Texas, made by Lieut. Col. H. M. Adams, Corps of Engineers, and referred to the Board by Department indorsement of November 11, 1902. In its investigation of the subject the Board has had before it letters from interested parties, has visited the locality and held public hearings at Beaumont and at points along the proposed channel, and has examined the route which it appears most desirable to follow. As the result of its investigation and deliberations, the Board has the honor to submit the following report:

2. The Sabine and Neches rivers both flow into Sabine Lake, the waters escaping from the lake through Sabine Pass into the Gulf of Mexico. The sea entrance has been improved by jetties constructed by the United States, and by dredging. A depth of 25 feet can probably be obtained when the damage done to the east jetty by the hurricane of September 8, 1900, has been repaired. At present there it a depth of about 21 feet at mean low water.

3. The pass is about 7 miles long. From its upper end, in Sabine Lake, to the town of Port Arthur, an artificial channel called the Port Arthur Canal has been dredged through the land by private interests, giving a depth of 25 feet from the head of the pass to the wharves at the town. This channel is 7¼ miles long and terminates at its upper end in Taylors Bayou, a natural navigable stream emptying into Sabine Lake. Vessels leaving the head of the canal cross Taylors Bayou to reach the wharves of Port Arthur. To reach Beaumont from Taylors Bayou vessels must pass through Sabine Lake, a distance of 11 miles, to the mouth of the Neches, and then must go 25.6 miles up that river. The depth in the lake is from 5 to 8 feet, and in the river is nowhere less than 15 feet. To reach Orange the distance through the shallow lake is 15 miles, and 10 miles from the mouth of the Sabine to the city. Thus, from Taylors Bayou to Beaumont is a total distance of 36.6 miles and to Orange a total distance of 25 miles, and those parts of these distances which lie in Sabine Lake have a ruling depth of only 5 to 8 feet.

4. In the past the United States Government has dredged an 8-foot channel into the Neches and a 7-foot channel into the Sabine. The ruling depth out of the Neches is now about 5½ feet and out of the Sabine about 6½ feet.

5. The commerce from Beaumont and Orange to the sea was until recently similar in character and comparatively small in amount, consisting largely in the carriage of sand and shells for building materials and in the transportation of lumber for export. Now, since the discovery of oil near Beaumont, very large quantities of that material are shipped via Port Arthur. In addition, recent agricultural advances have enabled rice to be grown in quantities on what was, until a few years ago, waste land. The timber and lumber trade continues large; and at present the water-borne commerce of the two localities amounts to 365,871 tons, valued at $955,136 annually, not including the item of oil piped at present to deep water.

6. In 1899 a Board of engineer officers reported a project for the improvement of the mouths of the two rivers by dredging a channel 9 feet deep along the east side of the lake, and recommended also the construction of a dredge. Previous to this report a survey had been made of the lake by Maj. James B. Quinn, Corps of Engineers, the report of which was printed as House Document No. 299, Fifty-fourth Congress, second session, and in the Annual Report of the Chief of Engineers for 1897, page 1789 et seq. This report presented estimates for four channels, of 25, 12, 8, and 6 feet depths, respectively, and recommended one of 8 feet depth, running directly from the head of the pass to the Neches River and thence to the Sabine River. The estimated cost was $150,000.

7. The natural course of the combined fresh-water flow of the two rivers appears to be along the east shore of the lake, where a deep channel could probably be maintained more easily than by any other route. A deep channel directly across the lake would require a heavy revetment to prevent filling; while the course along the west shore of the lake, although possessing certain features objectionable from an engineering point of view, is the one desired by practically all the citizens interested in the proposed improvement, both because it would give access to the wharves at Port Arthur and because the existing private Port Arthur Canal already gives deep water for 7¼ miles of the distance toward Sabine Pass, and may be utilized as part of the improvement, if no legal objection be found to such a course. Accordingly, an item in the river and harbor act of June 13, 1902, was inserted, as follows:

> Improving mouths of Sabine and Neches Rivers, Texas, in accordance with House Document Numbered Two hundred and ninety-nine, Fifty-fourth Congress, second session, by connecting the same with Sabine Pass by a channel 8 feet deep through Sabine Lake: Continuing improvement, one hundred and twenty-five thousand dollars: *Provided further*, That in the discretion of the Secretary of War he may select a route at or near the west shore of said lake and said channel may be connected with Port Arthur Canal: *Provided further*, That in case such connection is made boats shall be allowed to pass through the said canal without payment of any tolls.
>
> In case funds shall be furnished by the citizens of Orange and Beaumont or in any other way to secure a channel along the route herein described of a greater depth than eight feet, the amount herein appropriated may be expended in securing a greater depth than herein designated.

8. The provision in this act authorizing connection with the Port Arthur Canal might have been complied with without difficulty, since a full right existed to connect the channel with Taylors Bayou and

consequently with the canal, which opens directly into the bayou; but while the company has never charged any tolls for passing through the canal, yet, under its charter from the State of Texas, it is not clear that it does not have the right to make such charges. Accordingly, before choosing a route on the west shore of the lake, it was regarded as desirable to obtain the formal consent of the company to the use of its cut free of tolls. After correspondence, it developed that the company would not give such consent, and, in consequence, there remained no choice of route other than that named in Colonel Quinn's report, cited in the appropriation act. The local objection to the route directly through the lake was, however, so strong that the work has not been undertaken, the funds being withheld from expenditure for the present.

9. The same river and harbor act which appropriated funds in accordance with Colonel Quinn's plans provided, in addition, for a preliminary examination, as follows:

> Ship channel from Beaumont and Orange, on the Sabine and Neches rivers, to Sabine Pass on the west side of said lake, at or near the margin of said lake, with a view to excavating a channel of a depth of nine, twelve, eighteen, and twenty-five feet, and as to the practicability and feasibility of connecting the channel proposed above with the channel or canal now known as the Port Arthur Canal, extending from Sabine Pass to Port Arthur, and as to other matters touching the construction, excavating, and desirability of the channel herein proposed which may be deemed worthy or material, and as to such other facts in connection with the construction of said canal as the Secretary of War may deem proper.

This examination is the subject of the present report. The law, it will be noted, is still looking toward a connection with the Port Arthur Canal, and authorizes a report upon any facts in connection with the construction of said canal which the Secretary of War may deem proper.

10. The Port Arthur Canal was built in 1897–98, by a company interested in establishing a port somewhat removed from the Gulf. Near the end of the canal, upon Taylors Bayou, there have been constructed the terminals of the Kansas City Southern Railway. The canal has never been used to produce a direct revenue. It was, however, built to make money for its owners, through the lands and docks held by them at Port Arthur and through its connection with the railway. How far it has accomplished that object the Board can not say; but the financial benefit, such as it may be, has already been obtained, and it appears manifestly to the advantage of the canal company to transfer, free of cost to the United States, the canal and its maintenance, which is now a source of expense.

11. A connection with the canal through Taylors Bayou can be made with or without the company's consent, and such connection is in reality one of the weightiest arguments for a route along the west shore of the lake. It would be an apparently useless expense to dig a parallel channel in the lake itself. Nevertheless, should a channel be made from Beaumont and Orange, connected with the Port Arthur Canal, the result would be to turn into that canal a volume of traffic for which it was not originally intended; and in consideration of such public use the Board believes that the maintenance of the channel may properly, in that event, become a charge on public funds; but the Board does not believe that the canal should be purchased by the General Government, or that any money should be expended, except for maintenance after the channel from the river mouths shall have been finished. The canal was built as a private speculation; its route

was chosen and the methods of construction were naturally governed by the private interests of the owners. The result of the Government work on the jetties had placed the natural deep-water port at the town of Sabine Pass; the result of the company's work was to transfer that port, apparently for its own private advantage, to the town of Port Arthur; and the Board does not consider that any public funds should be expended to reimburse the company for an outlay made for its own gain. The principle underlying such a transaction is manifestly a dangerous one, especially in the light of the legislation in the last river and harbor act, which makes it less difficult than it has hitherto been for persons or corporations to undertake at their own cost the improvement of navigable rivers.

12. The act looks toward a channel of 9, 12, 18, or 25 feet depth, from the upper end of the Port Arthur Canal through the lake and up the Sabine and Neches rivers. The two shallower channels would require dredging through the lake, but probably none in the rivers. The two deeper ones would require work in the rivers as well, and the cost would be increased enormously. The commerce to be benefited is not large, except in the items of timber and oil. Much of the crude oil for export is now piped to existing deep-water points at Port Arthur, Sabine Pass, or Sabine, and the largest refinery in the district is located at Port Arthur. Some oil is now barged down from Beaumont, and some timber and lumber is barged or rafted down from Orange and Beaumont.

13. The cost of the 25-foot channel through the lake from the head of the pass to the mouths of the rivers was estimated by Colonel Quinn in 1897 at $6,237,000. If a connection with the Port Arthur Canal be made at Taylors Bayou, some of this cost will be diminished, but the remainder will be greatly increased by the work needed in the rivers, which was not included in the estimate and for which no survey or estimate has yet been made. It is not believed that the commerce in oil and lumber, or any other commerce likely to develop, would be benefited by a 25-foot channel to an extent commensurate with the cost.

14. There seemed to be a very general and practically universal feeling that the choice lies between the depths of 9 and 25 feet and that the intermediate depths mentioned in the act would be of little, if any, greater value than the 9-foot channel. The Board believes this to be the case. The wharves at Port Arthur are used by vessels which desire to load to the full depth permitted by the jetty channel and canal. Unless this depth is carried to Beaumont and Orange, the transfer from those points to Port Arthur would require only a barge channel, for which 9 feet is ample. No estimate has been made for a 9-foot channel on the west shore of the lake connecting with Taylors Bayou, but the cost would be manifestly much less than that of the 25-foot channel.

15. An objection has been made to the construction of a deep canal through the lake to the mouths of the rivers, on the ground that it would bring sea water into the latter to a greater extent, and render these waters unfit for rice irrigation during longer periods each season than is the case at present. Such a result from a 25-foot channel is not impossible; but the danger with a 9-foot channel would be less; and no opposition to such a channel was manifested by the rice growers.

16. The Board has corresponded with the president of the Port Arthur Canal and Dock Company, and has received from him replies,

which indicate no willingness to give formal consent to the use of the company's property free of charge. While it is perfectly practicable to connect any cut through the lake with the company's canal by way of Taylors Bayou, with or without the consent of the company, yet such a connection, as the only outlet to deep water, would not be wise unless the free use of the canal should be insured. The charter of the canal company is not conclusive on this point, and the Board recommends that the opinion of the proper legal officer of the Government be asked.

17. The Board believes that it is practicable and feasible to construct a channel of any of the depths named in the act, and to connect the same with the Port Arthur Canal; but is of opinion that such connection should not be made until the free use of the canal is assured, either with or without formal consent of the canal company.

18. The Board believes further that the commerce, present and prospective, will be sufficiently served by the construction of a channel 9 feet deep; that the local conditions of population and existing plant for the handling of commerce are such that this channel will be of greatest service if located on the west shore of the lake, and that it is advisable that the United States undertake this improvement, provided it can be effected at a reasonable cost. It recommends that the district officer be called upon for an estimate of the cost of making the necessary surveys, and that the necessary funds be allotted and the surveys made.

19. To summarize, the recommendations of the Board in the premises are:

First. That a project and estimate of cost be ordered for a channel 9 feet in depth from Beaumont and Orange to Sabine Pass on the west side of Sabine Lake, and that no steps looking toward a deeper channel be taken.

Second. That the advisability of the construction of a 9-foot channel, as outlined in the act, be left open until this estimate of cost shall be available.

Third. That the estimate for the channel above mentioned be separated so as to show the cost to Taylors Bayou and the cost to Sabine Pass without the use of the Port Arthur Canal.

Fourth. That the opinion of the proper legal officer of the Government be had as to the free use of the Port Arthur Canal under the terms of its charter from the State of Texas. A copy of the charter [a] is appended hereto.

Fifth. In case such opinion be adverse, that an attempt be made to secure the free use at an expense not exceeding the cost of maintenance, after the construction of the Government channel above Port Arthur, but that no negotiations be undertaken looking toward its acquisition at an expense exceeding this amount.

Respectfully submitted.

CHAS. J. ALLEN,
Lieut. Col., Corps of Engineers.
H. F. HODGES,
Major, Corps of Engineers.
EWD. BURR,
Major, Corps of Engineers.
C. H. MCKINSTRY,
Captain, Corps of Engineers.
W. V. JUDSON,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

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[a] Not printed.

SURVEY FOR SHIP CHANNEL FROM BEAUMONT, ON NECHES RIVER, AND ORANGE, ON SABINE RIVER, TO SABINE LAKE, THENCE ALONG THE WEST SIDE OF THE LAKE TO SABINE PASS, TEX., INCLUDING A CONNECTION BETWEEN SAID CHANNEL AND THE PORT ARTHUR CANAL.

United States Engineer Office,
New Orleans, La., December 12, 1903.

General: 1. In compliance with directions from the Chief of Engineers, I have the honor to submit an estimate of the cost for the construction of a 9-foot channel from Beaumont and Orange, Tex., to Sabine Pass, Tex., on the west side of Sabine Lake.

2. A survey was made in the vicinity of the proposed line to supplement data already available. A personal inspection of the proposed route was made, and conferences had with gentlemen representing the leading business interests of the towns concerned. This conference had for its object the determination of the location of the route which would best meet with the requirements of the interests most concerned.

3. The collection of commercial statistics was not undertaken, nor was the question of the necessity or desirability of the channel considered, as it was understood that these phases of the question had been fully investigated by the Board of Engineers for Rivers and Harbors.

4. As far as the location of the proposed channel was concerned, I found that all interests had practically agreed on the route along the west margin of the lake, although for different reasons. The Beaumont and Orange interests simply desire a channel to deep water, regardless of its location, provided it can subsequently be enlarged, if necessary, at reasonable cost. This seems to exclude a channel directly through the lake.

5. The Port Arthur interests desire a channel in front of the town, to serve as a harbor. They believe that the protection afforded the channel will also protect the town from damage by storms. If these conditions are complied with, they are otherwise indifferent as to the location.

6. The Port Arthur Canal and Dock Company had no representative present, and I could not learn their desires, but I understand that they are opposed to a connection with Taylors Bayou, unless at least the maintenance of their canal to its present depth will be assumed by the United States. It appears that a channel passing near the canal, but not necessarily connected with it, would benefit the canal company's interest by acting as a feeder for the canal.

7. Sabine and Sabine Pass interests are indifferent as to the location, so far as the Port Arthur Canal Company is not unduly favored, as their interests, as points for transshipment of freight, are antagonistic.

8. The rice interests favor a channel on the west side, but connecting with Taylors Bayou, for the reason that it would furnish fresh water for irrigation and tend to prevent the present inflow of salt water through the Port Arthur Canal.

9. The principal considerations, from an engineering point of view, in determining the location, are as follows:

(*a*) The protection and maintenance of the channel. The prevailing winds are from the northeast to southeast, and as the lake is shallow, during heavy storms the silt in the bottom of the lake is carried westward by the wave action and would be deposited in any dredged channel not protected by revetment of some kind.

(*b*) The usual type of dredged channel in the center of the lake would be entirely filled up, but it is possible that a wide channel, with very gentle side slopes, would not offer sufficient resistance to the passage of the silt to cause it to be deposited, and the channel might be maintained at reasonable cost.

(*c*) A channel on the west side, near the margin of the lake, would be protected by the shoal water to the eastward, especially if the dredged material, which is hard and stable in that vicinity, were deposited in an embankment to the eastward of the channel to a height several feet above high water.

(*d*) The disposition of the sediment carried by the Sabine and Neches Rivers.

As connection is made with the west branch of the Sabine River, the main stream would still carry most of the sediment into the lake as heretofore, but all silt from the Neches River would be carried into the dredged channel and would probably be deposited in the channel.

(*e*) If connection be made with Taylors Bayou, it appears extremely probable that much of this sediment will be deposited in the Port Arthur Canal, where the section will be suddenly enlarged, and consequently the velocity will be decreased with consequent deposit of sediment.

(*f*) The point of junction of the dredged channel with the two rivers should be more thoroughly protected against deposit of silt than by the earthen embankment formed from the dredged material, and also for the purpose of directing the water into the dredged channel, and it is proposed to use in that vicinity, either a form of creosoted revetment or rock and mattress revetment.

(*g*) The cross section of the channel will not be large enough to care for the entire discharge of the two rivers, but as the embankment will be brought up only to mean low water in the vicinity of the rivers, the flood waters can pass over the embankment into the lake.

(*h*) The channel in the lower end of the lake will probably maintain itself, as the entire discharge of the channel and of the lake will be concentrated through it.

(*i*) A bottom width of 100 feet is thought to be ample for the present needs. If a greater width is necessary it can be cheaply widened.

(*j*) A channel already exists connecting Taylors Bayou with the lake, which could be enlarged by the canal company to make connection with a channel direct to Sabine Pass.

(*k*) The channel near the west margin of the lake will not interfere with the navigation of the lake by sailing vessels.

(*l*) The channel near the west margin of the lake can be easily excavated by a clam-shell or dipper dredge, depositing the material outside of the cut where the channel is located near the shore. This cut can then be enlarged to its full dimensions by a hydraulic dredge. In the lower part of the channel the excavated material would be deposited as far to the westward of the channel as possible.

(*m*) Finally, the question of cost of maintenance: It is hard to say just what this will cost, but records show the deposit of 1,000 cubic yards of material in one day at the head of the Port Arthur Canal, and it is thought that the cost of maintaining the channel through the canal for a length of 7 miles to a depth of 25 feet will greatly exceed the cost of maintaining the alternative channel 4½ miles long to a depth of 9 feet.

10. The original cost of the channel, etc., is estimated to be as follows:

100-foot channel to Taylors Bayou:	
Wooden revetment	$382,000
Rock revetment	415,000
100-foot channel to Sabine Pass:	
Wooden revetment	415,000
Rock revetment	464,000
125-foot channel to Taylors Bayou:	
Wooden revetment	450,000
Rock revetment	484,000
125-foot channel to Sabine Pass:	
Wooden revetment	500,000
Rock revetment	550,000
200-foot channel to Sabine Pass:	
Wooden revetment	495,000
Rock revetment	530,000

11. These estimates are based on a channel 10 feet deep, thereby allowing payment for an overcut of 1 foot. The necessary revetment work is also included in the estimate in each case, as well as a reasonable amount for contingencies.

12. There is at present an approved project for an 8-foot channel 150 feet wide through the center of the lake, to be constructed at an estimated cost of $150,000. This channel, I do not think, could be maintained, except by being entirely redredged at frequent intervals.

13. From a consideration of the above estimates, I am of the opinion that, including the cost of future maintenance and repairs, the most advantageous channel is the 100-foot channel to Sabine Pass, along the west margin of the lake, with rock revetment where necessary, at an estimated cost of $464,000.

14. This recommendation is based on the supposition that if connection is made through Taylors Bayou with the Port Arthur Canal, the maintenance of this canal will have to be assumed by the United States. If the connection can be made without this maintenance obligation, the 100-foot channel to Taylors Bayou, with rock revetment, and costing $415,000, is to be preferred.

15. I am of the opinion that the present commerce does not justify this expenditure, but as the prospective commerce can not be developed until after the construction of this channel, and inasmuch as nearly $4,000,000 have been expended in the construction and the improvement of a deep-water harbor at Sabine, I am of the opinion that this further work is an improvement worthy of being undertaken by the United States at the present time.

Very respectfully, your obedient servant,

CHAS. S. BROMWELL,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., December 15, 1903.

1. Respectfully forwarded to the Chief of Engineers, United States Army.

2. The proposed 9-foot channel to be located along the west side of Sabine Lake from Sabine Pass to the mouth of the Neches River is 1.4

miles longer than the channel through the lake proposed in the project submitted by Maj. J. B. Quinn, Corps of Engineers, dated February 3, 1897 (H. Doc. No. 299, 54th Cong., 2d sess.). From the Port Arthur Canal to the mouth of the Neches River the proposed channel is along the margin of the lake in water less than a foot deep. The channel through the middle of the lake would be excavated in water 3 to 5 feet deep. The amount of dredging proposed in the present approved project is 1,500,000 cubic yards; the amount estimated in the proposed project is 3,025,262 cubic yards. The Port Arthur Canal was excavated through the upland; this land is so low that it was found necessary to construct a bulkhead at one point between the lake and the Port Arthur Canal to prevent sand from washing over from the lake into the canal. If the proposed canal is constructed in shoal water along the margin of the lake, it will be necessary to have a revetment of some kind for the whole length on the lake side in order to prevent the wash of sand and mud during the prevailing storms from filling the excavation. The proposed canal from Sabine Pass to the mouth of the Neches is 13.3 miles long. It is noted that Captain Bromwell estimates for a revetment only 1.5 miles long. From an engineering standpoint there is no good reason for locating the proposed canal along the margin of the lake, and I do not think the existence of Sabine Lake is sufficient reason for constructing a canal through the upland or along the margin of the lake. If it is desired to make the lake available for transportation purposes, it will be much less expensive to locate the channel through the deep water along the center of the lake. Channels so located through Galveston Bay, Atchafalaya Bay, and Mobile Bay have been maintained by dredging at a moderate cost. The approved project for channel through the lake does not contemplate the construction of any revetment work.

3. Commercial statistics were submitted with my report dated October 21, 1902. The amount of commerce from Beaumont and Orange to Sabine is very limited. I agree with Captain Bromwell in his statement that the present commerce does not justify the expenditure proposed in his report. What is most needed now for Sabine, Sabine Pass, Port Arthur, Beaumont, and Orange is the completion of the jetties at entrance to Sabine Pass and the dredging of a deeper channel between these jetties so as to give a channel entrance from the Gulf of at least 26 feet.

* * * * * * *

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

ESTIMATE OF COST OF BARGE CANAL, SABINE LAKE, TEXAS.

[Accompanying Captain Bromwell's report of December 12, 1903.]

A. Canal from mouths of Sabine and Neches rivers to Taylors Bayou, 100 feet in width, 10 feet deep, and with slopes of 2 horizontal to 1 vertical:

	Cubic yards.
Dredging:	
Sabine River Canal, from station 0 to 25	618, 347. 8
Neches River Canal, from station 0 to 7	95, 790. 2
Main canal, from junction of above	2, 208, 646. 4
Total	2, 922, 784. 4

Cost, wooden revetment:	
Dredging 2,922,784.4 cubic yards, at 11 cents	$321,506
Wooden revetment, 5,000 feet, at $7	35,000
Engineering and contingencies	25,494
Total	382,000

Cost, rock revetment:	
Dredging 2,922,784.4 cubic yards, at 11 cents	$321,506
Rock revetment, 5,000 feet	67,315
Engineering and contingencies	26,179
Total	415,000

B. Canal from mouths of Sabine and Neches rivers to Sabine Pass, 100 feet bottom width, 10 feet deep, and with side slopes of 2 horizontal to 1 vertical:

Dredging:	Cubic yards.
Sabine River Canal, from station 0 to 25	618,347.8
Neches River Canal, from station 0 to 7	95,790.2
Main canal from junction of above to Sabine Pass, station 95	2,311,123.7
Total	3,025,261.7

Cost, wooden revetment:	
Dredging 3,025,261.7 cubic yards, at 11 cents	$332,778
Wooden revetment, 8,000 feet, at $7	56,000
Engineering and contingencies	26,222
Total	415,000

Cost, rock revetment:	
Dredging 3,025,261.7 cubic yards, at 11 cents	$332,778
Rock revetment, 8,000 feet	104,298
Engineering and contingencies	26,924
Total	464,000

C. Canal from mouths of Sabine and Neches rivers to Taylors Bayou, 125 feet bottom width, 10 feet deep, and with side slopes of 2 horizontal to 1 vertical.

Dredging:	Cubic yards.
Sabine River Canal, from station 0 to 25	755,105.6
Neches River Canal, from station 0 to 7	117,680.1
Main canal, from junction of above to Taylors Bayou, station 75 plus 500	2,669,571.8
Total	3,542,357.5

Cost, wooden revetment:	
Dredging, 3,542,357.5 cubic yards, at 11 cents	$389,659
Wooden revetment, 5,000 feet, at $7	35,000
Engineering and contingencies	25,341
Total	450,000

Cost, rock revetment:	
Dredging, 3,542,357.5 cubic yards, at 11 cents	$389,659
Rock revetment, 5,000 feet	67,315
Engineering and contingencies	27,026
Total	484,000

D. Canal from mouths of Sabine and Neches rivers to Sabine Pass, Tex., 125 feet bottom width, 10 feet deep, and with side slopes of 2 horizontal to 1 vertical:

Dredging:	Cubic yards.
Sabine River Canal, from station 0 to 25	755,105.6
Neches River Canal, from station 0 to 7	117,680.1
Main canal, from junction of above to Sabine Pass, Tex., station 95	2,953,977.3
Total	3,826,763.0

Cost, wooden revetment:	
Dredging 3,826,763 cubic yards, at 11 cents	$420,944
Wooden revetment, 8,000 feet, at $7	56,000
Engineering and contingencies	23,056
Total	500,000

Cost, rock revetment:	
Dredging 3,826,763 cubic yards, at 11 cents	$420,944
Rock revetment, 8,000 feet	104,298
Engineering and contingencies	24,758
Total	550,000

E. Canal from mouths of Sabine and Neches rivers to Sabine Pass, Tex., 100 feet in bottom width, 10 feet deep, and with side slopes of 2 horizontal to 1 vertical, from mouths of Sabine and Neches rivers to station 24 (junction), and from station 24 (junction) to Sabine Pass, Tex., direct through Sabine Lake, 200 feet in width, 10 feet in depth, and with side slopes of 5 horizontal to 1 vertical, which may eventually silt up to bottom width of 100 feet, with very gentle side slopes.

Dredging:	Cubic yards.
Sabine River Canal, from station 0 to 24	588,555.0
Neches River Canal, from station 0 to 6	65,997.4
Main canal, station 24 to 88	3,308,090.2
Total	3,962,642.6

Cost, wooden revetment:	
Dredging 3,962,642.6 cubic yards, at 11 cents	$435,891
Wooden revetment, 5,000 feet, at $7	35,000
Engineering and contingencies	24,109
Total	495,000

Cost, rock revetment:	
Dredging 3,962,642.6 cubic yards, at 11 cents	$435,891
Rock revetment, 5,000 feet	67,315
Engineering and contingencies	26,794
Total	530,000

CHAS. S. BROMWELL,
Captain, Corps of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

WASHINGTON, *D. C.*, *March 1, 1904.*

GENERAL: Referring to eleventh indorsement on report dated October 21, 1902, by Lieut. Col. H. M. Adams, Corps of Engineers, on preliminary examination for channel from Beaumont and Orange to Sabine Pass, the Board of Engineers for Rivers and Harbors has the honor to report as follows:

1. In its report dated August 5, 1903, the Board expressed the opinion that it is advisable that the United States undertake the construction of a channel 9 feet in depth from Beaumont and Orange to Sabine Pass on the west side of Lake Sabine, provided the work can be done at reasonable cost, and recommended that a project and estimate of cost for such a channel be prepared. The Board has reviewed the accompanying reports and estimates prepared by the district officer, and has given due consideration to the indorsements of the division engineer thereon

2. From all the data now available on this subject the following summary is presented:

(*a*) The act approved June 13, 1902, appropriated $125,000 for a channel 8 feet deep through Sabine Lake, connecting the Sabine and Neches rivers with Sabine Pass, in accordance with the project submitted in House Document No. 299, Fifty-fourth Congress, second session. This project located the proposed channel through the lake. It was estimated that such a channel would cost $150,000, and $20,000 annually for maintenance, but an additional expenditure of $400,000 for revetment was recommended as desirable to give greater permanence to the channel. No work under this act has been undertaken. In 1899 a Board of Engineers estimated the annual cost of maintaining a 9-foot channel in a less exposed position along the eastern margin of the lake at $50,000. The district officer, in his report dated February 13, 1904, estimates the annual cost of maintenance of the channel through the lake at $33,750.

(*b*) The act above mentioned contained also a provision for a preliminary examination of "ship channel from Beaumont and Orange, on the Sabine and Neches rivers, to Sabine Pass on the west side of said lake, at or near the margin of said lake, with a view to excavating a channel of a depth of nine, twelve, eighteen, and twenty-five feet, and as to the practicability and feasibility of connecting the channel proposed above with the channel or canal now known as the Port Arthur Canal. * * *" The report upon the survey following the preliminary examination and a supplementary report made at the request of the Board are the subjects of present consideration. It is well understood that but one channel is needed between the mouths of Sabine and Neches rivers and the deep water of Sabine Pass, and that if a channel along the west shore of the lake is excavated the existing project for a channel through the lake should be abandoned.

(*c*) All interests involved, except the Port Arthur Canal Company and the people of the towns on Sabine Pass, have expressed a desire to have the channel located along the western margin of the lake, to connect, if possible, with the Port Arthur Canal at Taylors Bayou.

(*d*) The Port Arthur Canal Company has not authorized a connection to be made with the Port Arthur Canal, but it is understood that a movement is under way to place the control and maintenance of this canal in the hands of the United States.

(*e*) The present commerce involved is not large, and the greater part of the business on the Neches and Sabine rivers is local in character. At present the total annual commerce on these rivers below Beaumont and Orange is about 365,871 tons, valued at $955,136. Of this amount only about 21,821 tons, valued at $121,036, was carried through the lake for export. It is reported that the small amount of export business is due to the lack of sufficient depth through the lake.

(*f*) The cost of a 9-foot channel (excavated to a depth of 10 feet to provide a suitable margin), 100 feet bottom width, from the Neches and Sabine rivers, along the western margin of the lake, but outside of the present shore line, connecting with Taylors Bayou, with short rock revetments near the mouth of the Neches River and in front of Port Arthur, is estimated by the district officer at $415,000, and of a similar channel connecting with deep water in Sabine Pass, at $464,000. On the other hand the district officer estimates the cost of dredging an 8-foot channel through the middle of the lake at about $450,000, apparently considering it necessary greatly to increase the width in original excavation in order to secure a proper bottom width after the side slopes have flattened out. In the case of the marginal route he relies largely for the protection of the channel upon the excavated material to be placed upon the side next to the lake, thus forming a broad foreshore of shoal water.

(*g*) The distance from the Neches River to deep water in Sabine Pass through the middle of the lake is 13 miles; from the Neches to Taylors Bayou, 11 miles; from Taylors Bayou to the foot of the Port Arthur Canal, 7 miles; from Taylors Bayou to deep water in Sabine Pass on the line proposed through the lake for the 9-foot channel, 6 miles; and from the mouth of the Sabine to the mouth of the Neches River, 4 miles.

(*h*) The district officer recommends the connection with the Port Arthur Canal, provided it can be made without the United States assuming the maintenance of the Port Arthur Canal. If such connection can not be made without the assumption of this obligation by the United States, he recommends the connection with Sabine Pass by the marginal route at a cost of $464,000.

(*i*) The division engineer in first indorsement on Captain Bromwell's survey report of December 12, 1903, states that the proposed 9-foot channel on west side of the lake is 1.4 miles longer than the one through the lake proposed in House Document No. 299, Fifty-fourth Congress, second session; that the amount of dredging proposed in the present approved project is 1,500,000 cubic yards, while the amount estimated in the proposed project is 3,025,262 cubic yards; that if the channel is located along the western margin of the lake it will be necessary to have a revetment for its whole length, 13.3 miles, whereas the district officer has estimated for only 1.5 miles of revetment. He agrees with the district officer in his statement that present commerce does not justify the expenditure proposed, and is of opinion that "if it is desired to make the lake available for transportation purposes, it will be much less expensive to locate the channel through the deep water along the center of the lake."

(*j*) Desiring to have before it an estimate for a channel along a route that would eliminate the dangers of fill due to wave action, and that would answer in the future for a channel of any greater depth that might become advisable, the Board requested estimates for a channel connecting Taylors Bayou with the Neches and Sabine rivers, which should pass inside the shore line from a point immediately above Port Arthur, thus eliminating, as far as practicable, the need of expensive revetments. In his report, dated February 13, 1904, the district officer reports the cost of such channel, indicated as either route 1 or 2 upon the Coast Survey chart accompanying his communication, including a wooden revetment for that portion of the channel between Taylors Bayou and Port Arthur, at $536,500. The cost of a timber guard lock at the Neches River is estimated at $60,000. In the same communication the district officer estimates the cost of maintenance along route 1 or 2 at $30,000 annually. He further estimates the cost of maintenance of the unrevetted channel through the lake in accordance with the existing project at $33,750. In case the maintenance of Port Arthur Canal should become a charge upon the United States, the district officer estimates that $25,000 should be immediately expended for revetments, and that $10.000 annually would be required for maintenance.

CONCLUSIONS.

3. It is the opinion of the Board that a channel through Sabine Lake in accordance with the existing project should be estimated as of greater width and depth than are sought to be obtained upon the completion of the work, due to the fill that would be going on during construction. For this reason the Board believes that to secure an effective navigable channel 8 feet deep and of 150 feet bottom width would require the expenditure of approximately $200,000, and that the annual cost of maintenance should be estimated at not less than $50,000. Furthermore, the evident necessity for revetments, estimated by the district officer at $400,000, can not be ignored. The Board believes that the channel best suited to present commercial conditions, most easily maintained, and upon a route best adapted to future development would be that following either route 1 or 2, upon the Coast Survey chart, connecting Taylor's Bayou with the mouths of the Neches and Sabine rivers, estimated at $536,500, with $30,000 annually for maintenance. As a remote contingency a guard lock might be required at the Neches River.

4. The question then becomes, is it advisable for the United States to undertake the construction of such a channel at a cost of $536,500, with possible further expenditures for a guard lock, and with annual expenditures for maintenance of $30,000? After weighing the cost against the benefits the Board expresses the opinion that it is advisable for the United States to undertake the construction of such a channel, provided the Port Arthur Canal and Dock Company deed to the United States the Port Arthur Canal free of cost, in consideration of its maintenance by the United States, at an estimated cost of $10,000 per annum, provided local interests procure and deed to the United States, free of cost, the necessary right of way; and, further, provided the work be inaugurated by Congress under a continuous contract for completion. The Port Arthur Canal and Dock Company has not yet signified its willingness to deed the canal to the United States, nor to allow of its free use under any specified conditions. From an engineering point of view a connection with the Port Arthur Canal at Taylors Bayou is practicable and feasible.

5. In the event that the Port Arthur Canal and Dock Company and local interests fail to deed the canal and the necessary right of way to the United States, the Board is of the opinion that the construction of a canal on the west margin of the lake should not be undertaken. Furthermore, in such event it is the opinion of the Board that in lieu of the existing project there should be adopted a project for maintaining through the bars at the mouths of the Neches and Sabine rivers a channel 100 feet wide and 6 feet deep, at an annual cost estimated at $5,000.

Respectfully submitted.

A. M. MILLER,
Lieut. Col., Corps of Engineers.
R. L. HOXIE,
Major, Corps of Engineers.
W. V. JUDSON,
Captain, Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

SUPPLEMENTARY REPORT ON SURVEY.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., February 13, 1904.

GENERAL: 1. In compliance with instructions from the Chief of Engineers, I have the honor to submit the following report:

2. Three routes are considered for the proposed channel from Taylors Bayou to the Sabine River: The first from the mouth of Taylors Bayou, passing in front of the town of Port Arthur beyond the town limits, thence in a direct line to a point above the mouth of the Neches River, and thence to the Sabine River; the second, from the mouth of Taylors Bayou, passing in front of the town of Port Arthur beyond the town limits, and thence generally parallel to the shore line of the lake, to the same point on the Neches River, and the third, from a point above the mouth of Taylors Bayou, passing in the rear of the town of Port Arthur, and thence generally in a straight line to the same point above the mouth of the Neches River.

3. It is believed to be impracticable to secure the right of way, at any reasonable price, for a channel from the mouth of Taylors Bayou to the town of Port Arthur, passing far enough inside of the shore line to avoid any need of revetment, as it would pass through lands in use or reserved for terminals and wharves by the Kansas City Southern Railway, or through the property of the Port Arthur Water, Ice, and Light Plant, near the bank of the lake at the lower limits of the town.

4. The estimate of cost for route No. 1, from Sabine River to Taylors Bayou, is as follows:

	Cubic yards.
Dredging, Sabine River to Neches River, canal 100 feet wide, 10 feet deep, with side slopes of 2 to 1	610, 830
Dredging, Neches River to Taylors Bayou, canal 100 feet wide, 10 feet deep, with side slopes of 1 to 1	2, 782, 850
Total	3, 393, 680

3,393,680 cubic yards, at 11 cents per cubic yard	$373, 304
Right of way and cattle ferries	5, 000
Engineering and contingencies	21, 696
Total	400, 000

5. If the earth levee is not considered sufficient protection below the town of Port Arthur this estimate should be increased by $136,500, the cost of 19,500 feet of wooden revetment, at $7 per foot.

6. Route No. 2: Sabine River to Taylors Bayou. The cost is practically the same as for route No. 1.

7. In case the right of way could be secured inside the shore line from Port Arthur to Taylors Bayou the cost of the channel would be increased by the cost of the right of way for 500 feet wide and 3 miles long, at at least $400 per acre, $72,800, and the amount of dredged material would be increased by 176,000 cubic yards, at 11 cents per cubic yard, $19,360, making the total cost of route No. 1 or route No. 2, so modified, at least $492,160.

8. Route No. 3: Sabine River to Taylors Bayou.

This line passes in the rear of the town of Port Arthur, where the ground is now occupied by refineries and pipe lines, but it is thought possible that the line could be located about as shown.

	Cubic yards.
Dredging, Sabine River to Neches River, canal 100 feet wide, 10 feet deep, with side slopes of 2 to 1	610,830
Dredging, Neches River to Taylors Bayou, canal 100 feet wide, 10 feet deep, with side slopes of 1 to 1	3,088,165
Total	3,698,995

3,698,995 cubic yards, at 11 cents per cubic yard	$406,889
Right of way, 500 feet wide, 645 acres, at $100	64,500
Four highway turn bridges	125,000
Two railway turn bridges	125,000
Engineering and contingencies	25,611
Total	747,000

9. The estimate for the railway turn bridges is based on the cost of a turn bridge of about the same dimensions over the Rigolets, just constructed by the Louisville and Nashville Railway Company. To this original cost must be added $22,000 per year for the two bridges for painting, renewing timbers, services of bridge tenders, and the creation of a sinking fund for the entire renewal of the bridges at the end of about thirty years. The four highway turn bridges will also require about the same annual charge for maintenance and repairs.

10. If this route is adopted the lake mouth of Taylors Bayou should be closed to prevent excessive silting up at the head of the Port Arthur Canal, at an additional cost of $15,000.

11. A fourth route is also shown. This is a modification of route No. 1 or route No. 2, passing directly to Sabine Pass and not making connection with the Port Arthur Canal. Its cost is as follows:

Route No. 4, Sabine River to Sabine Pass, via Port Arthur.

	Cubic yards.
Dredging, Sabine River to Neches River, canal 100 feet wide, 10 feet deep, with side slopes of 2 to 1	610,830
Dredging, Neches River to opposite town of Port Arthur, canal 100 feet wide, 10 feet deep, with side slopes of 1 to 1	2,202,799
Dredging, Port Arthur to Sabine Pass, canal 100 feet wide, 10 feet deep, with side slopes of 2 to 1	704,725
Total	3,518,354

3,518,354 cubic yards, at 11 cents per cubic yard	$387,019
Wooden revetment, 10,000 feet, at $7	70,000
Engineering and contingencies	22,981
Total	480,000

12. The estimated cost for constructing a guard lock 50 by 150 feet is $60,000. The lock would be built on a substantial foundation of piles, with the lock walls, abutments, and gates of creosoted lumber. A lock, 40 by 150 feet, designed on these lines for use on the Mermentau River has just been completed at a cost of $40,000. The proposed lock will be slightly larger and of more substantial construction.

13. The yearly maintenance charges can at the best be but rough estimates. As the traffic through the canal increases and the sediment is kept agitated and constantly moving down the canal, it is thought

that the maintenance charges will decrease. The maintenance charges here given are based on the assumption that the yearly fill in the unprotected lake portion of the canal will not exceed 1 foot in average depth, while over the portion of the canal excavated inside the shore line the fill will not exceed one-half a foot in average depth per year. The estimate for maintenance will then be about as follows:

Dredging, Sabine River to Neches River, 77,777 cubic yards, at 15 cents	$11,666.66
Dredging, Neches River to Taylors Bayou, 105,556 cubic yards, at 15 cents	15,833.34
Superintendence, etc	2,500.00
Total	30,000.00

14. The Port Arthur Canal has been open for traffic for several years, but there is no general information on the subject of its maintenance charges. The best information is to the effect that when the canal was but little used the deterioration amounted to about 1,000 yards per day. It is known that most of the deposit was in the slips and turning basins at the head of the canal. Assuming that two-thirds of the material was there deposited, and that the material would not be so deposited if a constant current was running through the canal, it appears that about 100,000 cubic yards, corresponding to an average fill of about 1 foot, would have to be removed from the Port Arthur Canal, at a cost of about $10,000.

15. In two places the Sabine Lake has encroached on the canal, rendering some sort of protection necessary. This will entail an additional charge of about $25,000, if the United States should assume the maintenance of the canal.

16. The estimate for the maintenance of an unrevetted channel 8 feet deep and 150 feet wide is given by Major Quinn as $20,000 per year, "with reasonable promise of success." It appears, however, that when such a channel shall have shoaled to the depth of 7 feet redredging will be necessary, and that the price of redredging to a depth of 8 feet will be about 15 cents per cubic yard. Over the portion of the canal exposed to wave action the fill, it is believed, will be about one-half a foot per year, requiring dredging every second year to the amount of 450,000 cubic yards, at a cost of $67,500, or a yearly charge of $33,750. Any severe storm would largely increase this estimate.

Very respectfully, your obedient servant,

Chas. S. Bromwell,
Captain, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[Third indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., February 19, 1904.

Respectfully forwarded to the Chief of Engineers, United States Army.

It appears that Captain Bromwell has furnished the estimates and information required by the Board of Engineers on Rivers and Harbors in their indorsement[a] of January 19, 1904.

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[a] Not printed.

I agree with Captain Bromwell in his opinion (paragraph 3) that it is impracticable to secure the right of way at any reasonable price for a channel from the mouth of Taylors Bayou to the town of Port Arthur passing far enough inside of the shore line to avoid any need of revetment, and after consultation with Captain Bromwell I am of the opinion that the right of way for the route shown to the westward of Port Arthur (proposed route No. 3) can not be obtained at a reasonable price.

The act of Congress, approved June 13, 1902, appropriated $125,000 for constructing a channel 8 feet deep through Sabine Lake, in accordance with House Document No. 299, Fifty-fourth Congress, second session. It is stated in the above document: "This channel should run direct from the head of the pass to the Neches River, thence to the Sabine River," and the estimate submitted for such a channel without revetment is $150,000. A project providing for such a channel was submitted on August 14, 1902.

In my opinion the interests involved are not sufficient to warrant the expenditure of the large amounts named in the estimates herewith. I do not recommend any of the locations for the channel now proposed by Captain Bromwell. In my opinion, if a channel is to be constructed connecting the mouths of the Sabine and Neches rivers with Sabine Pass, it should follow the lines laid down in the project adopted by Congress and for which an appropriation has been made.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

T 12.

PRELIMINARY EXAMINATION OF SABINE RIVER FROM ITS MOUTH TO LOGANSPORT, LOUISIANA.

[Printed in House Doc. No. 177, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 8, 1903.

Sir: I have the honor to submit herewith a report, dated September 29, 1902, by Lieut. Col. H. M. Adams, Corps of Engineers, on preliminary examination of Sabine River, Texas and Louisiana, from its mouth to Logansport, ordered by the river and harbor act approved June 13, 1902. In the opinion of Lieutenant-Colonel Adams the locality is not worthy of improvement by the General Government.

Prior to 1900 the sum of $24,000 had been expended by the United States on the improvement of Sabine River above the mouth. The

Board of Engineers for Rivers and Harbors has reviewed this report, under the provisions of sections 3 and 14 of the above-mentioned act, and in its report of May 21, 1903, is given a résumé of the existing conditions on the stream, on which navigation is practically limited to the running of loose logs. The locality has been visited by a committee of the Board, a public hearing has been held, at which interested parties were afforded an opportunity to express their views, and, for reasons stated in its report, the Board concludes that it is not desirable for the United States to undertake this improvement.

I concur in the opinion of the Roard.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS.

United States Engineer Office,
New Orleans, La., September 29, 1902.

General: In compliance with Department letters dated June 23 and July 19, 1902, I have the honor to report upon the preliminary examination of Sabine River, Texas and Louisiana, from its mouth to Logansport, La., called for by river and harbor act approved June 13, 1902.

Sabine River from the mouth to Logansport, a distance of 315 miles, forms the boundary line between Louisiana and Texas. The river from the mouth to Belzora, Tex., was surveyed in 1873 by Mr. F. P. Leavenworth, under the direction of Capt. C. W. Howell, Corps of Engineers. A resurvey of the river from the mouth to Hamilton was made in 1879 by Mr. J. S. Polhemus, under the direction of Maj. S. M. Mansfield, Corps of Engineers, as a result of which appropriations were made and a depth of 5 feet of water secured for 30 miles above Orange. A preliminary examination of Sabine River from Sabine Lake to Sudduths Bluff, 83 miles, was made in 1891 under the direction of Maj. James B. Quinn, Corps of Engineers, who reported that the removal of snags would meet the present requirements of commerce, but did not consider that the improvement would be permanent. Maj. W. H. Heuer, Corps of Engineers, reported in 1886 that Sabine River was not susceptible of further improvement, and that no material increase of commerce or navigation had resulted from the improvements made. (Annual Report, Chief of Engineers, 1886, p. 222.) Capt. W. L. Fisk, Corps of Engineers, reported in 1888 (Annual Report Chief of Engineers, p. 1260):

> The dredged channel has shoaled somewhat, and many saw logs have been lodged in it, but there is deep enough channel for the very limited commerce using the river; and as the commerce is so small and not perceptibly increasing it is deemed inadvisable to make any further improvement at present. It is not evident that the improvements thus far made have been of much, if any, commercial advantage. When the channel was at its best freight rates were not reduced, nor did the commerce on the river perceptibly increase.

Appropriations, aggregating $24,000, made in 1879, 1882, 1892, 1894, 1896, and 1899 were expended for the improvement of the river above the mouth; no work has been done since 1900.

An examination of the river has just been made by Mr. A. H. Weber, assistant engineer. His report, which includes commercial statistics, is herewith.

Sabine River flows in a southerly direction and empties into Sabine Lake through three passes, the one generally used, West Pass, being 200 feet wide, the depth decreasing from 12 feet at the head to 6 feet at the entrance to the lake. From this pass to the foot of the Narrows not less than 15 feet of water was found. From the foot of the Narrows to a point 5 miles below the head, the least depth is from 3 to 5 feet. Above this latter place navigation is rendered impossible, except during high water, by numerous natural shoals and wreck heaps of saw logs and fallen trees. The width of the waterway from Logansport to the head of the Narrows is fairly uniform, varying from 130 to 300 feet. Through the Narrows it is from 120 to 200 feet, gradually increasing to 500 feet at Orange, Tex. Below Orange for about 2 miles the width is about 600 feet down to the cut-off, where it is quite narrow. In addition to the shoals and wreck heaps, the river is obstructed by log booms swung across the river and by numerous floating logs and deadheads, rendering navigation difficult and dangerous.

The country adjacent to the river is sparsely settled and most of it subject to overflow. A few small boats of light draft navigate above Orange during high-water season. The river is given up to logging, which is carried on under the regulations approved by the Secretary of War August 6, 1900, at the earnest solicitation of persons interested in lumber.

In my opinion, the river is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

H. M. Adams,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

[First indorsement.]

Office Chief of Engineers, U. S. Army,
October 6, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. Hodges,
Major, Corps of Engineers.

[Second indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., May 21, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has carefully considered the within report of the district officer upon a preliminary examination of Sabine River, Texas, from its mouth to Logansport, La., and all other data obtainable. A committee of the Board conducted a public meeting at Logansport, La., on May 9, 1903, at which were heard parties interested in the proposed improvement.

From Logansport to the mouth of the Sabine is a distance of about 315 miles. The lower 25 miles of the river has a least depth of 15 feet, but above this stretch the river is obstructed by shoals and snags to an extent that has discouraged steamboat navigation. Under regulations approved by the Secretary of War August 6, 1900, at the solicitation of parties most interested, the running of loose logs is permitted and navigation is well nigh impracticable above Orange, 12 miles from the mouth.

It developed at the public meeting that the improvement most desired was a thorough snagging of the river for a distance of 100 miles below Logansport, to the end that that town might become the market for the territory tributary to that section of river.

It is the opinion of the Board that the improvement above mentioned would confer benefits local in character, and not of magnitude sufficient to justify the first cost and subsequent expenditures for maintenance. Furthermore, if steamboat navigation were to be resumed, the running of loose logs could no longer be permitted in the river, and this very important business could be carried on only at greatly increased cost.

The Board believes that it is not desirable that the United States should undertake the improvement of "Sabine River from its mouth to Logansport."

For the Board:

Chas. J. Allen,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

REPORT OF MR. A. H. WEBER, ASSISTANT ENGINEER.

United States Engineer Office,
New Orleans, La., September 27, 1902.

Colonel: I have the honor to submit the following report upon a preliminary examination of Sabine River from Logansport, La., to the mouth at Sabine Lake, a distance of about 300 miles, made in accordance with instructions contained in your letter of August 30, 1902.

It being impossible to procure any means of water transportation at Logansport, the examination was made as far as Belgrade, Tex., 194 miles by river, with a team, touching at such points as could be reached from the wagon road. From Belgrade I went to Orange, Tex., by rail, and procured a small steamboat to the head of the Narrows and a gasoline launch to the mouth of the river. The examination was made September 3 to 13, 1902, the stage being ordinary low water.

GENERAL DESCRIPTION.

Sabine River from Logansport to the mouth forms the boundary line between Louisiana and Texas. It flows in a general southerly direction and discharges into Lake Sabine. Its course is very tortuous for the most part, and lies through a rich valley, 2 to 5 miles wide, most of which is subject to overflow. The country is sparsely settled, and is covered with a dense growth of hard-wood forests, with here and there a small clearing. The so-called towns are such only in name, having as a rule but one or two houses, one of which is a store or post-office. I believe the largest settlement between Logansport and Orange is Sabinetown, Tex., which has three or four houses and as many families. At each of these towns, and sometimes between, there is a flatboat rope ferry, which carries over one to two teams per day. In passing down the river, either by team on the "river road" or by boat, one travels for many miles, half a day at a time, without seeing signs of life or human habitation. The banks of the river at Logansport are over 30 feet high and are above extreme high water. From this point to the mouth of the river there is a gradual recession in the height of the banks, which, as a rule, are subject to overflow on one side of the river, if not on both, as far down as the vicinity of Belgrade, below which both banks are subject to overflow. From the head of the Narrows, and in many places above, the depth of overflow reaches several feet and occurs every year, which may account for the unsettled condition of the valley bordering the river. The watershed below Logansport is inconsiderable, while above it is quite large, and owing to these facts the stage may fluctuate very materially without local causes. At Logansport the highest water known occurred May 24, 1884, reaching a stage of about 30 feet above low water. In August of this year the river rose 25 feet at Logansport within a few days with no local rains or other influences. The period and extent of high or low water depends upon the rains in the upper country, and are very irregular in time and duration. The width of the waterway from Logansport to the head of the Narrows is quite uniform, as compared with most streams, being from 130 to 300 feet. Through the Narrows it is from 120 to 200 feet, gradually increasing to 500 feet at Orange. Below Orange the width is about 600 feet down to the cut-off, 2 miles below, where it is quite narrow, but gradually increasing in width from year to year. The river discharges into the lake through three channels, East Pass, South Pass, and West Pass, each one materially reducing the width. West channel is the one now used by boats, and is about 200 feet wide.

Like most winding streams, the waterway is made up of a series of pools and crossings, or shoals, the pools sometimes being several miles in length and of sufficient depth to be at all times navigable, which, however, is rendered impossible at low water on account of insufficient depth in the shoals.

From Logansport to Sabinetown the depths range from 2 feet on the crossings to as much as 20 feet in the pools. These great depths are not usual, however, the average ranging from 5 to 10 feet. Between Sabinetown and Columbus are the worst shoals on the river. The first is known as Goodlow shoal, one-half mile below Sabinetown; bowlders and lumps of rocky conglomerate rise above the water surface, increasing the current to such an extent that it is with difficulty a skiff can be handled. The second shoal is known as McClanahan shoal. This is a rocky reef extending across the river, over which the water becomes a rapid, falling about 1 foot in a distance of 60 feet. The depth on the reef is 6 inches to 1 foot. Two hundred feet below the rapid there is a large rocky mass in the center of the stream. It is circular in form, 40 feet in diameter, and 7 feet above the present stage. The waterway on either side of this rock is about 60 feet wide. Next comes a flat, smooth, rocky shoal extending the full width of the river, with 6 inches to 1 foot of water over it for a distance of about 200 feet. The next shoal, like the last one, has no name. It also is a rocky reef about 60 feet long, with a depth of 6 inches to 2 feet. The last and probably the worst of all the shoals is quite near Columbus. It extends over a distance of about 1,000 feet and consists of about fifteen rocky lumps 1 foot to 4 feet above the present stage, with innumerable obstructions between, through all of which a number of sinuous and uncertain channels run.

From Columbus to 5 miles below the head of the Narrows conditions somewhat similar to those above Sabinetown obtain—long distances of fair water rendered useless by shoals between. From 5 miles below the head of the Narrows the depths rapidly improve, the least being 3 feet for a distance of about 5 miles, beyond which there is a least depth of 5 feet to the foot of the Narrows. From this point there is an abundance of water, but few places showing as little as 15 feet. The least depth below Orange until the outlet through West Pass is reached, is through the cut-off, 2 miles below the town, where 15 feet was found. After entering West Pass the depth gradually decreases from 12 feet at the head to 6 feet at the entrance to the lake.

The current in the river at low water is very slight, being scarcely noticeable in the pools and only moderately swift over the shoals. The velocity increases with the stage, and during high water is probably 3 to 4 feet per second.

The range in stage decreases gradually from 30 feet at Logansport to 8 feet at Orange, and becomes practically nothing at the mouth.

OBSTRUCTIONS.

With the exception of the great shoals between Sabinetown and Columbus, the most serious obstructions to navigation are the trees that fall into the river from caving banks, and the saw logs that have sunk or have collected in jams. The number of logs sunk or stranded above Orange can be approximated in the following manner:

The output of the Orange mills for 10 years ending December 31, 1900, is reported to be 1,200,000,000 feet B. M., all of which was received in the log from upriver. It is estimated by lumbermen that the average log runs about 200 feet B. M. sawed lumber. This would give a total number of 6,200,000 logs. It is currently admitted by logmen that the loss from sinking and stranding, from the time the logs are thrown into the river until they reach the mill, is 10 per cent. This means that during a period of ten years 690,000 logs have found a lodging place in the river or within the timber nearby, where some of them are carried by the overflow. A brief account of my trip from Orange to the head of the Narrows with a small stern-wheel boat will give a fair idea of the difficulties attending steamboating at the present time.

For a distance of about 9 miles above Orange from one-half to two-thirds of the available width of the river is taken up with permanent booms, held in place by clusters of piles, driven at intervals of a few hundred feet. About 2 miles above town a floating boom was found completely across the river, used for the purpose of running the drifting logs into a permanent boom. This boom and about an acre of logs were pushed to one side by slowly working the boat against them, frequently running completely over some of the smaller logs. About 8 miles above Orange a jam of loose logs and small rafts was found which completely blocked the river for a distance of 500 feet between the permanent boom and the opposite shore. Through this obstruction the boat worked her way slowly, at times being completely surrounded by the drifting logs. No one seemed to be in charge of these logs or rafts and their presence was not thought unusual. On the contrary, I was informed that it was an every-day occurrence, and that it was not as bad at this time as during high water, when the majority of the logs are run. Some of the logmen make a feeble effort to raise the sunken logs, not for the purpose of clearing the river, but on account of their commercial value. Here and there will be seen a small catamaran flat with a crew of two men working a hand windlass raising a log that had been located by probing with a long pike pole. After entering the Narrows one is never out of sight of deadheads and log heaps. They collect in masses the size of which can not be estimated, as the greater part of the mass is below water and much of it imbedded in sand and mud. The upper 5 miles is practically a continuous nest of logs through which even a very light-draft boat is steered with much difficulty. In returning to Orange after dark the same jam of logs and small rafts encountered in the morning was found a few hundred feet farther downstream and it was necessary to force an opening again.

COMMERCE

During the past two years one or two small boats have made occasional trips as far up as Starks Landing, a distance of 130 miles, and once to Burrs Ferry, 183 miles. No boat has been above this during this period. A number of trips were made to Indian Bayou, a few miles below the head of the Narrows, where there is a small mill, for the purpose of towing logs and barging the output of the mill. Below Orange the commerce is very much better, and would undoubtedly increase if a suitable channel was opened up through the lake.

COMMERCIAL STATISTICS.

Vessels belonging in Orange and doing business either up or down.

Steam vessels	7
Barges	10
Number of trips up, 1901	38
Number of trips up, 1902 to September 1	23

Quite a number of vessels from outside have entered and left this port, but no record of them could be obtained.

Log tonnage into Orange from upriver.

	Tons.	Value.
Average for ten years ending December 31, 1900	248,000	$869,344
1901	235,000	825,000
To September 1, 1902	161,672	564,000

Tonnage above Orange other than logs.

	1901.		To September 1, 1902.	
	Tons.	Value.	Tons.	Value.
Railroad steel and supplies	600	$36,000	200	$12,000
Sawed lumber	45	275	395	2,370
Miscellaneous	185	5,550	172	5,160
Feed stuff	44	1,600	36	1,440
Total	6,274	43,425	803	20,970

NOTE.—The railroad materials were used in constructing iron tramways.

Tonnage below Orange, 1901.

	Tons.	Value.
Shells	16,000	$16,000
Sand	1,000	1,500
Brick	1,000	5,000
Rice	7,500	150,000
Merchandise	750	22,500
Railroad steel	4,500	270,000
Sawed lumber	15,621	93,736
Total	46,371	558,736

An effort was made to obtain a conservative estimate of the amount of commerce that would result from an improved river. Actual figures were secured at Logansport, but at Orange the general expression of opinion was that the amount of business would increase at least 100 per cent.

Estimate of prospective commerce at Logansport, based on an improved river, with open navigation eight months per year.

	Tons.	Value.
Cotton	2,000	$280,000
Staves	6,000	75,000
Cotton seed	250	3,000
Produce	10	300
Merchandise	1,000	30,000
Logs	15,000	70,000
Lumber	600	3,600
Total	24,860	461,900

Under existing conditions an ordinary light-draft boat can make a few trips each year as far as Logansport, by taking advantage of the uncertain periods of high water. No boat can run with safety as far as Logansport during more than three months of each year. Vessels drawing 3 feet of water can go as far as Burrs Ferry during about five months of each year, and as far as Indian Bayou, which is the actual head of navigation, the year round.

A channel of 3 feet depth as far as Logansport can be made by blasting and dredging through the rock shoals, dredging through a dozen or more sand and clay shoals, and removing sunken logs and overhanging trees.

To secure a greater depth than 3 feet would require the construction of a series of locks and dams, the cost of which can not even be approximated from the data on hand.

While the existing "regulations for the government of Sabine River" obtain, which permit the running of loose logs, navigation would never be safe, even with an improved river, and any permanent work that might be put in would be in constant danger.

I am of the opinion that Sabine River above Orange is unworthy of improvement by the General Government, and it will not need it below until a channel 15 feet deep is secured through the lake.

Very respectfully, your obedient servant,

A. H. WEBER,
Assistant Engineer.

Lieut. Col. H. M. ADAMS,
Corps of Engineers.

T 13.

PRELIMINARY EXAMINATION OF TANGIPAHOA RIVER, LOUISIANA.

[Printed in House Doc. No. 233, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 9, 1903.

SIR: I have the honor to submit herewith report dated August 6, 1902, by Lieut. Col. H. M. Adams, Corps of Engineers, on preliminary examination of Tangipahoa River, Louisiana, ordered by the river and harbor act of June 13, 1902. In the opinion of Lieutenant-Colonel Adams the locality is not worthy of improvement by the United States.

The Board of Engineers for Rivers and Harbors has reviewed this report, under the provisions of sections 3 and 14 of the above-mentioned act, and in its report of February 26, 1903, thereon, is given a statement of the expenditures and results heretofore obtained from operations by the United States on this stream. The Board concludes that it is not desirable for the United States to undertake this improvement, and I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., August 6, 1902.

GENERAL: In compliance with Department letters dated June 23 and July 19, 1902, I have to report in regard to the preliminary examination of Tangipahoa River, Louisiana, called for by act of Congress approved June 13, 1902.

The Tangipahoa River rises in the State of Mississippi, west of Summit, Pike County, flows through the State of Louisiana, and empties into Lake Pontchartrain. It was surveyed in 1871 by Lieut. E. A. Woodruff, Corps of Engineers, under the direction of Capt. C. W. Howell, and again in 1879 by Mr. H. S. Douglass, and in 1889 by Capt. W. L. Fisk. Appropriations were made for the improvement of this river in 1872, 1880, 1881, and 1884. In 1888 Captain Fisk reported the improvement as purely local in its benefits.

An examination of the Tangipahoa River has just been made by Mr. F. F. Axtell, junior engineer; copy of his report is herewith. He states that the Tangipahoa River is of no great commercial importance at present, about the only business being that of rafting logs.

In my opinion the river is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

H. M. ADAMS,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 14, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., February 26, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

Due consideration has been given to the within report of the district engineer, the report of the junior engineer, and several letters from persons interested in the Tangipahoa River.

This river was improved by the United States under several appropriations, amounting to $11,500, between the years 1872–1884, with no apparent benefit to commerce. The last work done on the river was in 1885. In his report for that year the Chief of Engineers states that "the improvement has been far from satisfactory; * * * no recommendation for appropriation is made; * * * the river is not susceptible of permanent improvement."

When consideration is given to the large sums that would be required to improve all the rivers of purely local importance which fall logically in the class with this one, the Board is compelled to believe that it is not desirable for the United States to undertake this improvement.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. F. F. AXTELL, JUNIOR ENGINEER.

NEW ORLEANS, LA., *August 6, 1901.*

COLONEL: In obedience to your orders, I have made an examination of the Tangipahoa River, and have the honor to report as follows:

I examined the river from Lees Landing, the recognized head of navigation, down to the mouth, a distance of about 12 miles, and found it in a splendid navigable condition, having a sufficient width (75 to 150 feet) and a depth of not less than 8 feet at a mean low stage. There are a number of deadheads or partially sunken logs in the river, but not enough to offer any serious obstruction to navigation.

Above Lees Landing the river ceases to be a tidal stream and is very shoal, so that it is not navigable.

The only hindrance to the navigation of the Tangipahoa River by large vessels as far up as Lees Landing is the bar in Lake Pontchartrain at mouth of river. I sounded this bar and found it very flat and shoal and composed of sand and clay. From the 6-foot contour in lake to the 6-foot contour in river it will average a distance of three-fourths of a mile, and for 1,000 feet of that distance the depth of water is only 3 feet at a mean low stage.

It will require the removal of about 18,000 cubic yards of material to secure a channel 6 feet deep and 60 feet wide across the bar, at a cost of $4,500.

It has been demonstrated that dredging a channel in Lake Pontchartrain without protecting the channel dredged will not secure permanency for such channel. Protecting works at this point, however, are not recommended on account of the cost. But it is believed that if a proper channel is dredged and the material dredged is removed to a sufficient distance to prevent its return to the dredged channel that such channel will maintain itself for from four to five years.

At the present time Tangipahoa River is of no great commercial importance, about the only business on the river being that of rafting logs. In calendar year 1901 there were 34,330 logs, valued at $119,000, rafted down the river and across the bar at mouth. All loaded schooners and barges must be lightered over the bar or wait, sometimes for days, for an extreme high tide in the lake. All this has proven so expensive that such traffic has nearly ceased. Logs are handled by small tugs in the river, which also tow them out over the bar to a larger tug waiting for them out in the lake. Each firm doing a logging business is thus compelled to maintain two tugs and crews where one tug and crew would suffice were there deeper water over the bar.

With improved navigation the commercial importance of the river should greatly increase. The logging business would be revived, sawmills would probably be established on the river, immense deposits of sand and shells along the banks of the river could be utilized, and the people living near the river could obtain their supplies cheaper and in less time than is at present possible with the long wagon hauls—5 to 12 miles—from nearest railroad station. It is safe to say that a yearly commerce of at least $250,000 would follow as a natural result of the dredging of a channel across the bar at mouth of river.

I consider this river worthy of improvement to the above-mentioned extent.

Very respectfully, your obedient servant,

F. F. AXTELL,
Junior Engineer.

Lieut. Col. H. M. ADAMS,
Corps of Engineers.

T 14.

PRELIMINARY EXAMINATION OF BAYOU TIGRE, VERMILION PARISH, LOUISIANA.

[Printed in House Doc. No. 192, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 7, 1903.

SIR: I have the honor to submit herewith a report dated September 20, 1902, by Lieut. Col. H. M. Adams, Corps of Engineers, on preliminary examination of Bayou Tigre, Louisiana, ordered by the river and harbor act approved June 13, 1902.

In the opinion of Lieutenant-Colonel Adams the locality is not worthy of improvement by the General Government, and the Board of Engineers for Rivers and Harbors, which has reviewed this report under the provisions of sections 3 and 14 of the above-mentioned act, states in its report of March 19, 1903, that it is not desirable for the United States to undertake this improvement.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., September 20, 1902.

GENERAL: In compliance with Department letters dated June 23 and July 19, 1902, I have the honor to report upon the preliminary examination of Bayou Tigre, Louisiana, called for by act of Congress approved June 13, 1902.

Bayou Tigre has its source in Vermilion Parish, La., and discharges into Bayou Petite Ance through a canal dug by adjoining plantation owners, and thence into Vermilion Bay.

An examination of Bayou Tigre has just been made by Mr. J. I. Conklin, superintendent. Copy of his report is herewith.

There is no commerce on Bayou Tigre at present and the benefits from its improvement would be entirely local.

In my opinion, the bayou is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

H. M. ADAMS,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 24, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 19, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has carefully considered the within report of the district officer and that of the superintendent.

The present and prospective commerce involved is small in extent and local in character.

The improvement desired would not be of a permanent nature, and its cost would be disproportionate to resulting commercial benefits.

The Board is therefore of the opinion that it is not desirable for the United States to undertake the improvement of Bayou Tigre, Louisiana.

For the Board.

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. J. I. CONKLIN, SUPERINTENDENT.

United States Engineer Office,
Plaquemine, La., September 18, 1902.

Sir: I have the honor to submit the following report on preliminary examination of Bayou Tigre:

Bayou Tigre proper is a narrow inland lake, with its source at Erath. At Erath the junction of the drainage waters from a portion of the parishes of Vermilion and Lafayette has washed out for a distance of 2½ miles a channel in the low prairie land; at that distance the washing seems to have formerly stopped.

The neighboring planters have, for purposes of more rapid drainage, dug a canal from the end of Bayou Tigre into Bayou Petite Ance, a distance of about 1 mile. At a distance of about one-half mile below the mouth of this canal another canal has been dug for a distance of about 3 miles, to Lake Peigneu, through a low, flat prairie. This branch of the canal is now called Grand Marais. These two canals, with the bayou proper, are now regarded by the inhabitants as Bayou Tigre.

The canals were originally dug only 18 inches in depth, but have been washed out and widened by the natural drainage of the place. The canal from Bayou Tigre to Bayou Petite Ance is about 3 feet in width, and about 4 or 5 feet in depth.

From Erath to the canal into Petite Ance there is a width of about 100 feet and average depth of 9 to 10 feet. The canal from Bayou Petite Ance to Lake Peigneu is about 20 feet in width and has a depth of 16 to 18 inches in low water.

From the mouth of the canal Bayou Petite Ance winds through about 12 miles of salt marsh into Vermilion Bay, which is the only outlet by water for the commerce of the vicinity.

At a distance of 2 miles from the bay the Avery Salt Company have cut a canal 60 feet in width and 10 feet in depth out into Vermilion Bay; but bar has formed at the mouth, and the canal has been abandoned by the salt company as an outlet for their product. The bar at the mouth of this canal is about three-eighths of a mile in extent. The bar at the natural mouth of Petite Ance is nearly a mile in length and is about 3 miles around the shore from the mouth of Erath Canal.

The improvements desired by the community interested are: The dredging of the bar at the mouth of Bayou Petite Ance; the straightening and deepening of portions of Bayou Petite Ance; the dredging of a 50-foot channel, 6-foot depth, from Bayou Petite Ance to Bayou Tigre, and dredging a 50-foot channel, 6-foot depth, from Bayou Petite Ance to Lake Peigneu.

Roughly estimated quantities of excavation.

	Cubic yards
Bayou Tigre to Bayou Petite Ance	40, 000
Bayou Petite Ance to Lake Peigneu	250, 000
Bayou Petite Ance to bay, natural route	200, 000
Bar at mouth, natural route	40, 000
Total	530, 000

The Avery family would turn over to the Government the canal from Bayou Petite Ance to the bay if the Government agreed to maintain deep water; if not, they would sell the canal for $28, 000.

The product of the neighborhood of Bayou Tigre is now shipped to New Iberia, on a branch of the Southern Pacific, and there is no sugar mill nearer than New Iberia.

There was shipped the last year by this branch road from Erath, Meadows, and Bobacres the following products:

Sugar cane	tons	30,000
Rice	sacks	25,000
Corn	barrels	20,000
Cotton	bales	3,000
Salt	tons	50,000
General merchandise shipped to these points		$125,000
Fuel for rice irrigation		$25,000

The benefits claimed from this improvement are cheaper transportation, opening market for sugar cane to Bayou Teche mills, cheaper rate for fuel for rice plants; sugar mills may be built in the neighborhood if fuel rates are lowered; 8,000 acres of land lying idle could be utilized if transportation could be had, and timber lands developed about Lake Peigneu.

Bayou Tigre just touches the country interested and does not run through it, and only the immediate country could be benefited.

The canal from Bayou Petite Ance to Lake Peigneu is desired most for drainage and was originally dug for that purpose alone, and I do not consider it worthy of improvement for the commerce, present or future, and it is doubtful if the route through Vermilion Bay could be safely used for the kind of shipping that could be utilized on the canal, with the exception of small sailing craft.

Bayou Petite Ance is a very winding stream and is full of mud flats and the channel is with difficulty followed. Considering the extreme doubt of the channel being used when completed, I do not think the Government would be justified in expending the amount of money required to develop the stream for the small country it would benefit, unless the Avery family would turn over to the Government unconditionally the abandoned canal, 2 miles in length, from Bayou Petite Ance to Vermilion Bay. In that case, I would recommend a survey of the bar at the mouth of canal and of the canal above from Bayou Tigre to Bayou Petite Ance, so that accurate estimate of cost could be made.

Estimated cost of survey, $1,500.

Very respectfully, your obedient servant,

J. I. Conklin,
Superintendent.

Lieut. Col. H. M. Adams,
Corps of Engineers, U. S. A.

T 15.

REESTABLISHMENT OF HARBOR LINES AT SABINE PASS, TEXAS.

Treasury Department,
Washington, March 9, 1903.

Sir: I have the honor to request that if practicable and not incompatible with the interests of the Government committed to your charge a slight modification may be made in the harbor line established March 19, 1896, for Sabine Pass, Tex. The modification requested is shown on the blue print[a] inclosed herewith, and consists in the substitution of a straight line x y in lieu of the two straight lines x A and A y, which are parts of the lines Tex. 2 A and A B, respectively, of the established harbor line.

This modification would affect only a short portion of the westerly line near the United States life-saving station now under construction. It will be observed that the present harbor line divides the station in twain. It was originally intended to place the station upon the submerged portion of a lot acquired for the purpose, but through a misunderstanding with regard to the location of the harbor line the foundation of the station was built only partially on said lot. It is now deemed desirable that the entire structure should be to the eastward of the harbor line, it being believed that the proposed change in said line would effectually discourage the construction of wharves in the neighborhood of the station which would menace the safety and welfare of the station in several respects, viz:

---

[a] Not printed.

(1) The dredging necessary in such work would tend to destroy the bank into which the piles under the life-saving station are driven, thus exposing the lower portion of the piles below the copper sheathing to the attacks of the teredo.

(2) The proximity of wharves would expose the station to danger from fire, especially as the shipping would undoubtedly consist principally of oil.

(3) The location of wharves in the near neighborhood would greatly increase the liability of the collision of vessels with the station.

(4) It is understood that vessels in quarantine are permitted to load and unload within a certain distance of the quarantine station and that the life-saving station falls within this distance. The construction of wharves in the immediate vicinity of the station, therefore, would expose the latter to the dangers of contagion and infection.

The site was located with the view to secure a position exempt from these unfavorable possibilities, but since the various oil companies have within the last year commenced to construct wharves at a distance from the shore and only connected therewith by pipe lines, the aspect of the safety of the station has so changed as to induce the above request.

Respectfully,

L. M. Shaw, *Secretary*.

The honorable the Secretary of War.

[Eleventh indorsement.]

Office Chief of Engineers, U. S. Army,
May 18, 1903.

Respectfully returned to Captain Bromwell, requesting that a tracing and description of the proposed modification of the harbor line be furnished this office. Attention is invited to the bearing from X to A, which, as given on the sketch of April 25, 1903, does not agree with the line as drawn.

To be returned.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Twelfth indorsement.]

United States Engineer Office,
New Orleans, La., July 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army, inviting attention to report of this date.

Chas. S. Bromwell,
Captain, Corps of Engineers.

[Fourteenth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 8, 1903.

Respectfully returned to the Secretary of War.

In the within letter the Secretary of the Treasury submits request for modification of harbor line in the vicinity of the life-saving station at Sabine Pass, Tex.

The existing harbor lines at this locality were established in 1896, and, owing to changed conditions, have for some time been unsatisfactory to local interests. Advantage has been taken of the present request to give the subject thorough consideration, and, as a result of this investigation, the local engineer, Captain Bromwell, presents a new scheme of harbor lines for Sabine Pass, involving certain modifications of the existing lines which experience has shown to be desirable and correcting slight errors in the harbor-line chart as originally drawn.

The modified lines are delineated and described on the tracing[a] accompanying Captain Bromwell's report of July 13, 1903, herewith. The change indicated at the site of the life-saving station is not that suggested by the Treasury Department, but is satisfactory to said Department, as is shown by eighth indorsement[a] hereon. It is understood that the other changes involved, including the omission of any lines above the site of the recently constructed Port Arthur Canal, are acceptable to the local commercial and landed interests.

Concurring in the views of the local officer, I recommend that the lines now presented be approved, and that the Secretary place his approval upon the tracing, which has been prepared for his signature.

Should this action meet with the sanction of the Secretary of War, I would recommend further that the map showing the harbor lines for Sabine Pass, approved under date of March 19, 1896, be canceled.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

NOTE.—The lines referred to above and shown on the map mentioned were approved by the Secretary of War under date of August 12, 1903, the approval being indicated upon the map.

LETTER OF CAPT. CHAS. S. BROMWELL, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., July 11, 1903.

GENERAL: I have the honor to forward herewith a tracing[a] showing the proposed harbor lines at Sabine Pass, Tex.

The present harbor lines at Sabine were laid out on a map prepared in May and June, 1895, by Mr. J. L. Brownlee, assistant engineer, and the bearings and lengths of the courses of the harbor lines were measured from the map.

A comparison of this map with maps of both earlier and later dates discloses the fact that the shore line of the Brownlee map is in error, especially in the northern half of the map. The error seems to have been due to an erroneous reading or plotting of one of the traverse courses.

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[a] Not printed.

Since the harbor lines were laid out with reference to the shore lines, it follows that the bearings of the harbor lines are in error. In other words, if the present harbor lines are laid out on a correct map by the bearings and lengths of its courses it will throw the approved harbor lines several hundred feet from their intended location.

The proposed harbor lines, however, bear about the same relation to the correct shore line as the present harbor line does to the incorrect shore lines on the Brownlee map, except that the line "Tex. 2—A" is changed to "O—A," and a similar change is proposed for the harbor line on the east shore near the jetty.

As the Brownlee map is in error, it is impracticable to plot the present harbor line on this map for the sake of comparison. There is no need for a harbor line above Port Arthur Canal, and none is proposed.

If the proposed line meets with the approval of the Secretary of War, I have the honor to request that the tracing be returned to this office in order that blueprints may be prepared for file.

The proposed change in the vicinity of the life-saving station is in accordance with my recommendation of April 25, 1903, which recommendation meets with the approval of the general superintendent.

The recommendation made April 4, 1903, was only provisional, and that recommendation is now withdrawn.

Very respectfully, your obedient servant,

Chas. S. Bromwell,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

APPENDIX U.

IMPROVEMENT OF CERTAIN RIVERS AND HARBORS IN TEXAS.

REPORT OF CAPT. EDGAR JADWIN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Galveston Harbor, Texas.
2. Galveston channel, Texas.
3. Channel from Galveston Harbor to Texas City, Texas.
4. Galveston ship channel and Buffalo Bayou, Texas.
5. Operation and care of Morgans Canal, Texas.
6. Trinity River, Texas.
7. Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of the adjacent streams, including Trinity River and Cedar Bayou, Texas.
8. Brazos River, Texas, from Richmond to Old Washington.
9. Mouth of Brazos River, Texas.
10. Aransas Pass, Texas.
11. Harbor at Brazos Santiago, Texas.
12. Construction of sea wall, etc., along the front of the Fort Crockett Reservation, and from Thirty-ninth to Forty-fifth streets, Galveston, Texas.

EXAMINATIONS.

13. Guadalupe River, Texas.
14. Channel between Matagorda and Lavaca bays, Texas.
15. St. Charles Bay, Texas.
16. Trinity River, Texas, section 1, between Dallas and the East Fork.

HARBOR LINES.

17. Galveston Bay at Texas City, Texas.

United States Engineer Office,
Galveston, Tex., July 20, 1904.

General: I have the honor to forward herewith annual reports for the works of river and harbor improvements in my charge for the fiscal year ending June 30, 1904.

Very respectfully, your obedient servant,

Edgar Jadwin,
Captain, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

U I.

IMPROVEMENT OF GALVESTON HARBOR, TEXAS.

The river and harbor act approved June 13, 1902, appropriated $350,000 for maintaining the entrance to the harbor and toward the restoration of the jetties, in accordance with the report submitted in House Document No. 134, Fifty-sixth Congress, second session, and authorized the letting of a contract in the sum of $400,000 exclusive of amounts appropriated.

OPERATIONS DURING THE YEAR—JETTIES.

Operations were carried on during the year under a contract entered into April 6, 1903, and approved May 13, 1903, with J. M. O'Rourke & Co., of Galveston, Tex.

South jetty.—34,069.18 tons of granite blocks were delivered by the contractor at Ninth street and Avenue A and unloaded and placed by hired labor and United States plant between stations 6 and 143+63, completing the crest of the jetty for a distance of 8,105 feet.

North jetty.—45,991.63 tons of granite riprap were unloaded and placed by the contractors, filling the most serious gaps in the jetty between stations 100 and 185, a distance of 8,500 feet.

DREDGING.

A detailed description of the U. S. dredge *Gen. C. B. Comstock* will be found on pages 1530–1531, Annual Report of the Chief of Engineers for 1896.

During the year the dredge was overhauled and repaired.

The dredge excavated, removed, and dumped from Galveston Harbor 674,491.1 cubic yards of material.

A detailed account of the work done during the fiscal year will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, to which attention is invited.

RESURVEY OF GALVESTON BAY.

The work during the year has been the drafting of the chart. The necessary data to complete the chart was procured during the survey of Galveston Harbor and entrance for the present annual report. There only remains to complete the chart the reduction of the late survey and its transfer to the chart.

SURVEYS.

The report of Mr. E. M. Hartrick, assistant engineer, gives detailed description of the surveys during the year. Attention is also invited to the map submitted with this report.

Total amount expended on this improvement to June 30, 1904, $8,887,222.59.

The balance available on June 30, 1904, and additional appropriation recommended it is proposed to apply to operating the U. S. dredge *Gen. C. B. Comstock* in maintaining, widening, and deepening the channel between the jetties and repairing the north and south jetties.

Money statement.

July 1, 1903, balance unexpended		$579,975.75
Amount appropriated by sundry civil act approved April 28, 1904		100,000.00
Proceeds of sale of condemned property		41.33
Refundment by officer		15.36
		680,032.44
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$235,011.44	
For maintenance of improvement	43,113.93	
		278,125.37
July 1, 1904, balance unexpended		401,907.07
July 1, 1904, outstanding liabilities		70,949.23
July 1, 1904, balance available		330,957.84
July 1, 1904, amount covered by uncompleted contracts		244,822.39
Amount (estimated) required for completion of existing project		750,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$750,000.00	
For maintenance of improvement	50,000.00	
		800,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

ABSTRACT OF APPROPRIATIONS.

By act of—		By act of—	
July 11, 1870	$25,000	March 3, 1891	$600,000
March 3, 1871	20,000	August 5, 1892	450,000
June 10, 1872	31,000	March 3, 1893	1,000,000
June 23, 1874	60,000	August 18, 1894	600,000
March 3, 1875	150,000	January 25, 1895	200,000
August 14, 1876	142,000	March 2, 1895	1,160,000
June 7, 1878	75,000	February 26, 1896	300,000
June 18, 1878	50,000	June 3, 1896	50,000
March 3, 1879	100,000	June 11, 1896	840,000
June 14, 1880	175,000	June 4, 1897	500,000
March 3, 1881	250,000	March 3, 1899	50,000
March 4, 1882	100,000	June 13, 1902	350,000
August 2, 1882	300,000	March 3, 1903	300,000
August 5, 1886	300,000	April 28, 1904	100,000
August 11, 1888	500,000		
September 19, 1890	500,000	Total	9,278,000

In addition to the above appropriations by Congress there has been collected from the steamship *Maritime*, $300; from Quartermaster's Department, United States Army, $719.83; from sales of condemned property, $94.47; transfer of tug *Anna*, $10,000, and refundment by officer, $15.36; making a total of $9,289,129.66.

CONTRACTS IN FORCE.

Contractor: J. M. O'Rourke & Co., Galveston, Tex.
Character of work: Repairing jetties.
Rates:
- For Galveston south jetty, large blocks, from 5 to 7 tons each, f. o. b. cars United States track Ninth street and Avenue A, or eastward thereof, or Fort Point, Galveston, Tex., $2.59 per ton.
- For Galveston north jetty, large riprap in pieces from 10 to 12 tons each, properly placed in the work, $3.89 per ton.

Date of approval: May 13, 1903.
Date of beginning work: August 16, 1903.
Date of expiration: South jetty, July 31, 1904; north jetty, October 31, 1904.

COMMERCIAL STATISTICS OF GALVESTON HARBOR, TEXAS, FOR THE FISCAL YEAR ENDING JUNE 30, 1904.

Tonnage of vessels and revenue collected.

	Steam vessels.	Sailing vessels.	Total.	Total tonnage.
Entered	1,015	162	1,177	2,446,113
Cleared	1,045	264	1,309	2,569,568
Total	2,060	426	2,486	5,015,681

Duties on imports collected	$388,435
All moneys collected at custom-house	444,287

Amount and value of freight entered and cleared.

Articles.	Amount.	Approximate value.
	Tons.	
Cotton (2,461,121 bales)	645,626	$155,793,298
Cotton products	186,146	5,646,762
Ore	3,989	146,970
Wool	29,971	8,993,765
Grain	619,040	15,350,467
Sugar	140,606	14,060,780
Coal	38,288	231,433
General merchandise	512,293	330,392,446
Flour	61,605	2,358,935
Lumber and manufactures of wood	185,514	2,202,045
Cement	29,548	295,480
Petroleum	1,999,444	6,612,022
Manufactures of iron and steel	42,555	1,402,410
Cattle and other animals	22,394	1,347,231
Total	4,517,019	544,834,044

Increase of freight compared with last year ....tons	964,302
Increase of value, compared with last year	$96,923,337

REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

GALVESTON, TEX., *July 8, 1904.*

CAPTAIN: I have the honor to submit the following report of operations for improving the harbor of Galveston, Tex., during the fiscal year ending June 30, 1904.

CONDITION OF THE WORK.

Jetties.—At the beginning of the fiscal year south jetty had been partially repaired by filling in gaps in shore branch between stations 0 and 143, with 27,763.16 tons of sandstone riprap preparatory to covering with granite blocks. A track over the shore branch of south jetty had been built for the repairs and construction of fortifications between station 0, at Ninth street, and station 143+63, a distance of 14,363 feet. Seven hundred and fourteen feet of sidetrack had been laid between stations 68+50 and 75+64, and wharves and warehouses at Fort Point, connected by turnouts to jetty track.

A contract had been entered into with J. M. O'Rourke & Co., approved May 13, 1903, for the repairing, restoring, and completing of the jetties as recommended in Report of Board of Engineers, work to commence August 16, 1903, and to be completed October 31, 1904, on north jetty, and July 31, 1904, on south jetty. North jetty was still in apparently the same condition as reported on by Board of Engineers. (See Doc. 134, 56th Cong., 2d sess.)

At the end of the fiscal year south jetty shore branch is nearly complete, with a granite-block crest covering, and on north jetty the larger gaps have been filled and covered with granite riprap. The repairs on south jetty are about one-third and on north jetty one-fourth complete.

Dredging.—At the beginning of the fiscal year the outer and inner bars had 27¼ feet of water over their crests at mean low tide, a depth in many cases greater than in front of Galveston wharves.

The end of the year the condition over the bars remained about the same, 27¼ feet, with 30 feet alongside of Galveston wharves for nearly their whole length. (See report on Galveston channel.) Mean-tide fluctuations on outer bar, 2 feet; inner bar, 1.64 feet; Galveston channel, 1.12 feet.

OPERATIONS DURING THE YEAR.

South jetty.—On July 31, 1903, the contractors commenced the delivery of granite blocks on shore branch of south jetty, the United States Government unloading and placing the blocks.

Statement of material and labor expended, with cost of same, in the repair of south jetty, Galveston Harbor, during the year ending June 30, 1904.

34,069.18 tons granite blocks, at $2.59 per ton	$88,239.18
Cost of unloading, placing, repairs to track, and incidental expenses	20,736.42
Total	108,975.60

The blocks were unloaded and placed between stations 6 and 143+63.

During August, 1903, two wooden tanks, with a combined capacity of 834.75 barrels, were erected in coal bin at Fort Point for the storage of fuel oil.

North jetty.—Work on the delivery and placing of stone for the repairs of north jetty commenced on the 17th of August, 1903, and was continued gulfward from station 100 to station 185, a distance of 8,500 feet. Only the more serious gaps in the jetty are filled, on account of the small appropriation, which gives a very irregular appearance to the work. The large granite riprap, ten to twelve tons, for repairs of north jetty, comes from Granite Mountain, Tex., 382 miles from Galveston. It is delivered by rail at the Southern Pacific wharves, transferred by floating derrick to barges, thence to north jetty and unloaded by another floating derrick and placed in the work.

Statement of material used, and cost of same, in the repair of north jetty, Galveston Harbor, during the year ending June 30, 1904.

45,991.63 tons granite riprap, at $3.89 per ton	$178,907.44

The riprap was unloaded and placed between stations 100 and 185.

Grade raising.—On January 5, 1904, permission was granted Messrs. Goedhart & Bates, the contractors for raising the grade of the city of Galveston, to cut the south jetty at Sixth street and put in and operate a drawbridge. They are not to interfere with the traffic to and from the fortifications, and on completion of their contract with the city the draw is to be removed and the jetty replaced.

DREDGING OPERATIONS IN GALVESTON HARBOR BY U. S. DREDGE GEN. C. B. COMSTOCK, G. M. PRENDERGAST, MASTER.

From July 1 to August 15 the dredge was continuously employed on outer bar channel, when weather permitted, and at other times on channel over inner bar. From August 16 to October 18 the dredge was laid up for extraordinary repairs at a total cost of $12,692.52. From October 19 to June 30, 1904, the dredge was continuously employed on outer bar, when weather permitted, and at other times on Galveston inner bar channel.

On June 1, 1904, the dredge was put on a double-crew system, as follows: Crew increased to 40 men, work starting at 4 a. m. and finishing at 8 p. m., dredge going to anchor each evening in Bolivar Roads, with the exception of Saturday and Sunday nights, when dredge is berthed at pier to receive supplies.

Galveston Harbor.

	Amount dredged.		Rate per minute.	Rate per hour.
	Number of loads.	Cubic yards.		
			Cu. yards.	*Cu. yards.*
Outer bar, sand, clay, and shell	578	320,392.2	8.07	484
Inner bar, sand and mud	650	354,104.9	7.59	455
Total	1,228	674,497.1	7.81	469

Cost of dredging.

Operating cost per cubic yard for fiscal year	$0.04
Total cost per cubic yard for fiscal year	.059

Amounts expended.

Wages	$13,935.48
Subsistence	3,076.47
Fuel	5,754.50
Oils, waste, etc	762.86
Ordinary maintenance	3,445.34
Operating cost	26,974.65
Extraordinary repairs	12,920.02
Total cost	39,894.67

Distribution of working time.

	h.	m.
Anchor to cut	115	36
Pumping	1,439	15
Cut to dump	241	20
Dumping	74	27
Dump to cut	152	33
Dump to anchor	205	28
Time lost turning	14	3
Effective working time	2,242	42

Distribution of time.

	h.	m.
Effective working time	2,242	42
Delays for bad weather	204	6
Delays for repairs	636	57
Delays for other causes	371	23
Delays for Sundays and holidays	728	0
Total time	4,183	8

Cost of repairs to dredge (August 16 to October 18, 1903).

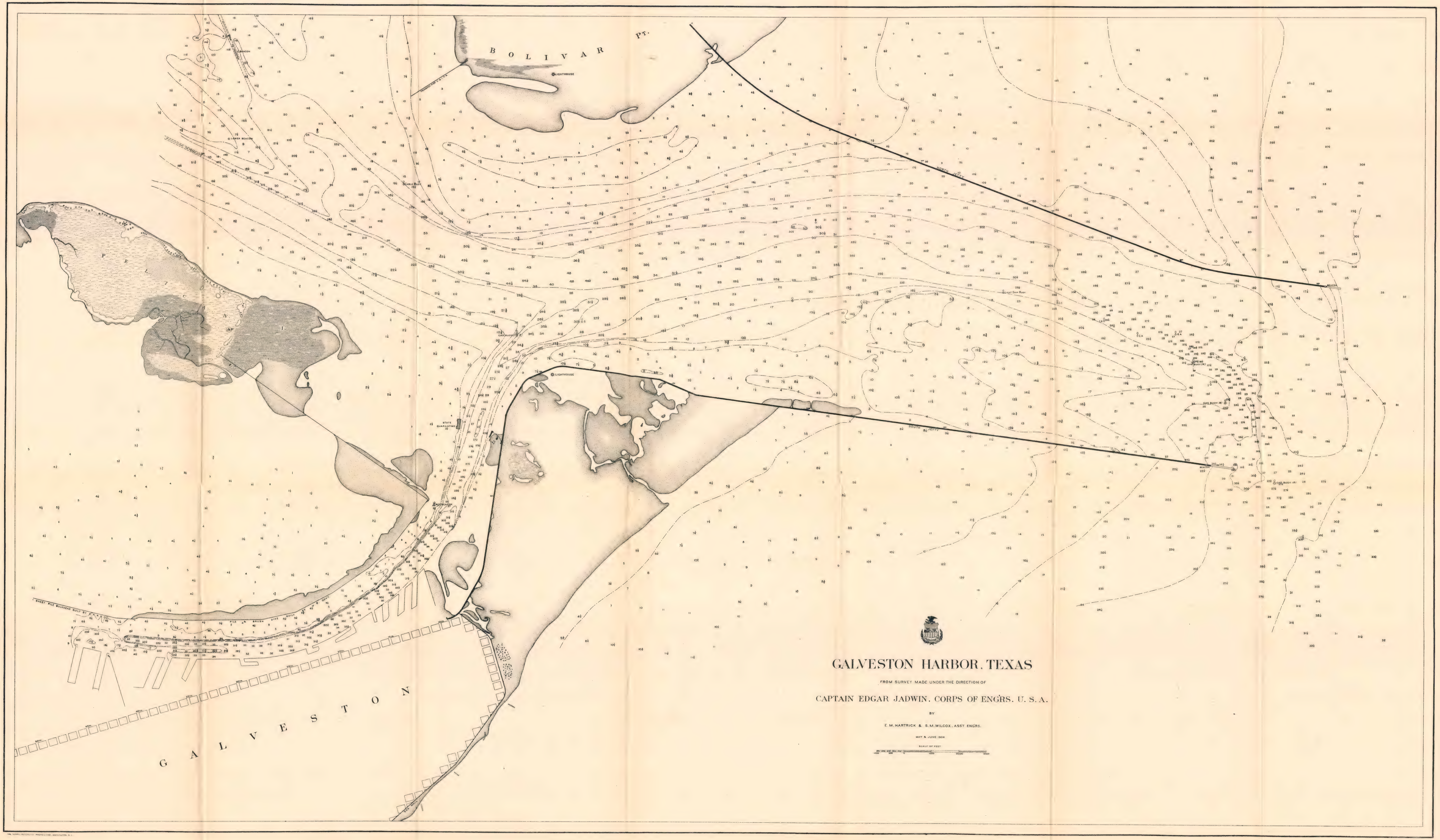
Hauling out on ways	$350.00
Ship carpenters' wages	387.50
Ship calkers	62.50
Laborers	403.60
Machine, blacksmith, and coppersmith work	4,717.65
Suction pipes and connections	2,330.52
Miscellaneous purchases	114.47
Hardware and ship chandlery	653.08
Lumber	342.50
Regular crew's salary	2,774.33
Subsistence while repairing	532.22
Fuel	24.15
Total cost of repairs	12,692.52
Other repairs during year	227.50
Total repairs for year	12,920.02

MODEL.

A model of Galveston Harbor and entrance was made for the Louisiana Purchase Exposition and shipped to St. Louis April 29, 1904.

SURVEYS.

Resurvey of Galveston Bay.—The necessary data to complete the chart of the resurvey of Galveston Bay was procured during the survey of Galveston Harbor and entrance for the present annual report. There only remains the reduction of the



GALVESTON HARBOR, TEXAS

FROM SURVEY MADE UNDER THE DIRECTION OF

CAPTAIN EDGAR JADWIN, CORPS OF ENG'RS. U. S. A.

BY

E. M. HARTRICK & S. M. WILCOX, ASS'T. ENG'RS.

MAY & JUNE 1904

THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

late survey and its transfer to resurvey chart when it will be ready for any disposition that may be decided upon.

Bar and harbor survey.—There has been no complete survey of Galveston Harbor and entrance since the one made immediately after the hurricane of September 8, 1900. Bar surveys were made in 1901–3, which show from 26 to 27¼ feet of water over their crest. The present survey of May and June, 1904, plotted on a scale of 1:10,000, extends from the most western pier of the Southern Pacific Company, about Forty-fifth street, to 30 feet of water in the Gulf, including Bolivar Roads, the entrance to Texas City channel, Galveston Ship channel, and Buffalo Bayou, Pelican Island and flats, etc. Soundings have also been taken to the 40-foot contour in the Gulf and are being plotted on a smaller scale, 1:20,000, for easy reference and comparison.

By comparing the present survey with that of 1900, taken immediately after the hurricane, there will be observed some very pronounced changes.

Galveston inner bar has been widened and deepened, and Galveston channel has a channel 550 feet wide and over 30 feet deep for nearly the whole length of wharf front, the result of dredging and scour caused by pile and brush dike, reenforced with spoil from channel. The shoal and channel between the 30-foot curves, abreast of and between stations 170 and 230, South Jetty, have moved north. The 12-foot contour at eastern point of this shoal has advanced gulfward over 2,600 feet, with no corresponding advance of the 30-foot channel inside the bar. The shoal on the outer bar, bounded by the 24-foot curve, has increased its area, encroaching on the bar channel, advancing in the Gulf from 350 to 1,000 feet. The 30-foot curve in the Gulf has advanced from 500 to 2,300 feet. The channel over the outer bar between the 24-foot curves has narrowed to about 1,000 feet, but the depth has increased from 26 to 27¼ feet.

Very respectfully, your obedient servant,

E. M. Hartrick,
Assistant Engineer.

Capt. Edgar Jadwin,
Corps of Engineers.

U 2.

IMPROVEMENT OF GALVESTON CHANNEL, TEXAS.

OPERATIONS DURING THE YEAR.

Under the emergency contract for constructing pile and brush dike on the north side of the channel, entered into September 13, 1902, with Moore & Sieber, of Texas City, Tex., 147,118 linear feet of piling and 2,016.35 cords of brush were placed in the dike, completing the contract. This dike is for the purpose of holding the material dredged from the channel and preventing same being carried back into the channel by the action of the currents.

Under the contract of the Bowers Southern Dredging Company, of Galveston, Tex., for dredging, entered into on February 9, 1903, and approved March 2, 1903, 1,789,467 cubic yards of material were excavated from prescribed cross section and 203,686 cubic yards below prescribed cross section.

The U. S. dredge *Gen. H. M. Robert* excavated and deposited behind the pile and brush dike on Pelican Island and flats 243,563.7 cubic yards of material.

A detailed account of the work done during the fiscal year will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith to which attention is invited.

Prior to the adoption of the project for the improvement of Galveston channel by Congress, the channel in front of the wharves had been kept open and dredged by private enterprises. The amount of maintenance necessary is increased by the greater width of channel now afforded, and will increase further as the channel is widened under the present project.

An examination of the survey on which the project was based, and of the surveys ahead of the dredges now at work, show a filling of approximately 675,400 cubic yards in eighteen months for a 550-foot channel. This has decreased the amount of original excavation that could be done with available funds, as the contractor is paid for filled-in material the same as for original material.

It is much less expensive to dredge the filled-in material, though it is difficult, at this locality, to determine exactly how much, on account of its being dredged at the same time with original material. Evidence of the cost of handling such light material is, however, had in the dredging of the Galveston and Houston ship channel, where, at one time, the contractor had approximately a month with one dredge working in material which had silted in since previous dredging. The dredge excavated 400,000 cubic yards in the month, for which under the contract it was necessary to pay $36,000.

The work, including deterioration of plant, probably cost actually about one-fifth of this amount. In other words, if the United States had owned the dredge, the same work could have been done for one-fifth the price or five times as much work done for the same money.

It would seem that the time had arrived when the United States can best do its maintenance in Galveston channel by acquiring, either by purchase or construction, a dredge which would be available for keeping the channel already made in good condition, and could apply its remaining time to a further widening of the channel in accordance with the approved project.

Such a dredge is worth not to exceed $125,000. The estimate of amount that can be profitably expended to June 30, 1906, is based on this plan.

Total amount expended on this improvement to June 30, 1904, $218,075.41.

The balance available on June 30, 1904, and additional appropriation recommended it is proposed to apply to dredging and maintenance of pile and brush dike.

Money statement.

July 1, 1903, balance unexpended	$261,102.69
June 30, 1904, amount expended during fiscal year, for works of improvement	179,178.10
July 1, 1904, balance unexpended	81,924.59
July 1, 1904, outstanding liabilities	32,965.49
July 1, 1904, balance available	48,959.10
July 1, 1904, amount covered by uncompleted contracts	31,521.27
Amount (estimated) required for completion of existing project	1,285,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	250,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

ABSTRACT OF APPROPRIATIONS.

By act of—	
June 13, 1902	$100,000
March 3, 1903	200,000
Total	300,000

CONTRACTS IN FORCE.

Emergency contract.

Contractor: Moore & Sieber, Texas City, Tex.
Character of work: Constructing pile and brush dike.
Rates: Piling in place, 11 cents per linear foot; brush in place and fastened, $2.45 per cord.
Date of approval: (Emergency contract.)
Date of beginning of work: January 27, 1903.
Date of expiration: Completed March 30, 1904.

Formal contract.

Contractor: Bowers Southern Dredging Company, Galveston, Tex.
Character of work: Dredging.
Rate: 8.3 cents per cubic yard.
Date of approval: March 2, 1903.
Date of beginning work: June 14, 1903.
Date of expiration: December 31, 1904.

Emergency contract.

Contractor: Geo. V. Cresson Company, Philadelphia, Pa.
Character of work: Cutter, engines, etc., for dredge.
Rate: $5,900.
Date of approval: (Emergency contract.)
Date of beginning work: No date.
Date of expiration. Time limit waived. Completed June 30, 1904.

COMMERCIAL STATISTICS.

See report on improvement of Galveston Harbor, Texas, which applies to this improvement.

REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

GALVESTON, TEX., *July 8, 1904.*

CAPTAIN: I have the honor to submit the following report of operations for improving Galveston channel, Texas, for the fiscal year ending June 30, 1904:

CONDITION OF THE WORK.

At the beginning of the fiscal year a channel 1,000 feet long and 550 feet wide with an average depth of 29 feet had been excavated under contract with the Bowers Southern Dredging Company, of Galveston, Tex., between Red beacon, toward Tenth street wharf. A pile and brush dike 14,756 feet long, practically complete, had been built on Pelican flats, 1,400 feet distant from and parallel to the Galveston wharves, to retain the spoil excavated, protect the shipping during northers, and to assist in maintaining the channel.

At the end of the fiscal year the pile and brush dike, 21,393 feet long, had been finished, and a channel 10,000 feet long and 550 feet wide and over 30 feet deep had been completed between Red beacon and Thirty-first street. From Thirty-first street to Thirty-sixth street the channel is 160 feet wide and 30 feet deep, and between

Thirty-sixth and Thirty-ninth streets there is a shoal cut 150 feet wide, about 400 feet from wharf front, the remains of a cut made to reenforce the pile and brush dike. Total amount excavated to date, 1,993,153 cubic yards. Variation of level of water surface about 1 foot.

OPERATIONS DURING THE YEAR.

Pile and brush dike.—Piling was completed September, 1903, and the brush filling March 17, 1904.

Statement of material used and cost of same in pile and brush dike during year ending June 30, 1904.

147,118 linear feet piling, at 11 cents per linear foot	$16,182.98
2,016.35 cords brush, at $2.45 per cord	4,940.06
Total cost	21,123.04

Total cost of pile and brush dike.

282,433 linear feet piling	$31,067.63
2,228.45 cords brush	5,459.67
Total	36,527.30

As the work of excavating and dumping behind the pile and brush dike progressed the contractor, at his own expense, kept the dike more or less tight by filling in between the piles with extra brush. Where the spoil was clay no trouble was encountered, as it remained above water and withstood wave action, but where it was silt or sand the waves eroded the spoil bank and reduced the height to very little above mean low tide. This allowed the free passage of the tidal currents, which at station 5 + 650 broke through, leaving a crevasse 40 feet wide and 12 feet deep. By driving large stakes and filling in with brush held down with bags containing clay, the crevasse was stopped. There are several more such places which have no clay backing, and are therefore dangerous to the maintenance of the channel. The small dredge *Pigmy* worked on the low places for a short time and raised the bank considerably, using brush to retain the spoil, which was sand. The *Gen. H. M. Robert* to more advantage closed up one low place, and on her return from North Jetty cut will continue reinforcing by removing material from Galveston channel at the north side of the 1,200-foot cut. Until there is a good bank of sand with a long flat slope toward the north, or a clay bank, there will always be danger of breaks in the dike, especially during strong northers, when wave action undermines the bank and flattens out the spoil to a greater or less degree, depending upon the character of the material.

Dredging.—The contractors' plant, consisting of *No. 4* and *George Sealy*, continued at work. The spoil was deposited north of the dike constructed by the Government on Pelican flats. In March *No. 4* was removed from the work. *George Sealy* lost during the year about five weeks on account of repairs.

Amount of material excavated by each dredge during the year.

	Cubic yards.
George Sealy	1,773,353
No. 4	219,800
Total removed	1,993,153

Statement of material excavated and removed, with cost of same, during year ending June 30, 1904, Galveston channel.

	Quantity.	Rate per cubic yard.	Cost.
	Cubic yds.	*Cents.*	
Prescribed cross section	1,789,467	8.3	$148,525.77
Below prescribed cross section	203,686	$4\frac{3}{20}$	8,452.97
Total	1,993,153	....	156,978.74

About eleven-twelfths of the present contract is completed.

DREDGING OPERATIONS BY U. S. DREDGE GEN. H. M. ROBERT, J. A. MASCULINE, MASTER, IN REINFORCING PILE AND BRUSH DIKE ON PELICAN SPIT AND FLATS.

At the beginning of the fiscal year the dredge was working on the east side of the pile and brush dike constructed on Pelican spit and flats, between Red beacon and Pelican Island. The excavated material was deposited on the west side of the piling to reinforce the dike.

During the year good progress was made through Pelican spit, as it is composed of fine sand, and ran freely to the suction; but, on the other hand it was difficult to retain the fine sand behind the brush, the spoil returning freely to the cut. By extending the pipe line and a liberal use of brush a bank has been maintained. As the dredge advanced toward Pelican Island more or less clay was encountered, reducing her capacity to such an extent that a cutter was found to be necessary. The dredge was hauled out in April, 1904, overhauled, extra heavy chains and braces put in, bed built for swinging engines, casing for spud, etc. She was launched on May 16, and the work of installing the cutter machinery commenced. On June 25, 1904, she reported ready for work, and on June 29, 1904, excavated and removed 300 cubic yards of material in about an hour.

Work done reinforcing pile and brush dike on Pelican Island and flats.

Advance of dredge	feet..	3, 840
Quantity excavated	cubic yards..	243, 563. 7
Width of channel (average)	feet..	80
Depth of cut	do....	14

The material excavated was composed of quicksand mixed with mud and was deposited behind the dike, and has an average elevation of about 1.3 feet.

Dredging without cutter.

Effective working time (out of a possible 4,380)	hours..	2, 205. 38
Delays for bad weather	do....	40. 10
Delays for repairs	do....	1, 025. 05
Delays from other causes, Sundays and holidays	do....	725. 00
Average output per hour	cubic yards..	110. 44
Average output per minute	do....	1. 84
Total number of cubic yards excavated during the year		243, 563. 7
Cost per cubic yard		$0. 085

Dredging with cutter and spuds, June 29, 1904.

Operated for one hour, approximately	cubic yards..	300
Cost of operating dredge for one hour		$3. 91
Cost per cubic yard dredging with cutter		$0. 013

Very respectfully, your obedient servant,

E. M. Hartrick,
Assistant Engineer.

Capt. Edgar Jadwin,
Corps of Engineers.

U 3.

IMPROVEMENT OF CHANNEL FROM GALVESTON HARBOR TO TEXAS CITY, TEX.

The dredging of this channel is being done under contract entered into with the Drake & Stratton Company of New York, N. Y., for $250,000.

The terms of this contract, as amended by supplemental articles of agreement in accordance with the river and harbor act approved June

13, 1902, provide that payment of 5 per centum of the whole contract price shall be made from time to time for each 1,000 linear feet along the length of the channel, whenever it shall satisfactorily appear to the Secretary of War that depth of 25 feet and width of 100 feet at the bottom are obtained, until the sum of $200,000 has been paid, after which no payment shall be made until the whole channel has been completed to the required width and depth, at which time the balance of the contract price shall be paid.

OPERATIONS DURING THE YEAR.

Contractors dredged channel from station 20 to 35, a distance of 15,000 feet, to prescribed cross section, and cleaned up channel to a depth of 27 feet between stations 35 and 27+650, a distance of 7,350 feet.

Contractor's dredge was taken off the work in December, 1903, to dredge out slips at Texas City, Tex. On May 18, 1904, the dredge returned to the work and commenced operations at station 0+6, cleaning up to 25 feet preparatory to sweeping.

A detailed account of the work done will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, to which attention is invited.

Amount expended on this improvement to June 30, 1904, $200,000 from appropriations by Congress and $2,796.77 from the amount deposited by contractors for expenses of superintendence, inspection, etc.

Money statements.

DEPOSIT OF CONTRACTORS.

July 1, 1903, balance unexpended	$2,629.44
June 30, 1904, amount expended during fiscal year	426.21
July 1, 1904, balance unexpended	2,203.23

GENERAL IMPROVEMENT.

July 1, 1903, balance unexpended	$50,000.00
July 1, 1904, balance unexpended	50,000.00
July 1, 1904, amount covered by uncompleted contracts	50,000.00

ABSTRACT OF APPROPRIATIONS.

By act of March 3, 1899	$250,000

CONTRACTS IN FORCE.

Contractor: The Drake & Stratton Company, New York, N. Y.

Character of work: Dredging.

Rates: $250,000 (5 per cent of contract price to be paid for each 1,000 feet of completed channel until $200,000 has been paid, after which no payments shall be made until whole channel is completed).

Date of approval: January 22, 1900.

Date of beginning work: June 30, 1900.

Date of expiration: September 12, 1904.

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1904, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1904.

REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

Galveston, Tex., *July 8, 1904.*

Captain: I have the honor to submit the following report of the operations for the improvement of the channel from Galveston Harbor to Texas City, Tex., during the fiscal year ending June 30, 1904:

CONDITION OF THE WORK.

At the beginning of the fiscal year the channel, 100 feet wide at the bottom and 25 feet deep, was provisionally completed to station 20, a distance of 20,000 feet. Between station 20 and 24 there remained about 100,000 cubic yards to be removed, and between station 24 and 34, 220,000. The ruling depth was 18 feet on a shoal near station 20, and 24 feet over the earlier completed sections, which had silted up. Variation of level of water surface is about 1¼ feet.

At the end of the fiscal year the channel had been cleaned up to full width, 100 feet, and full depth, 25 feet, from station 0+6 at Texas City wharves to station 8+45, a distance of 7,850 feet. Ahead of the dredge some sections have shoaled to 16 feet, but as Galveston Harbor is approached the depth increases to 25 feet.

OPERATIONS DURING THE YEAR.

From station 20 to 35, a distance of 15,000 feet, channel was excavated to prescribed cross section, 100 feet wide at bottom and 25 feet deep, provisionally completing the channel in October, 1903, between Texas City, and 25 feet of water in Galveston Harbor, a distance of 35,000 feet.

The dredge was then turned around and commenced working toward Texas City, cleaning up to a 27-foot depth between station 35 and 27+650, a distance of 7,350 feet, preparatory to sweeping for final payment.

In December, 1903, the dredge was taken off the work and removed to Texas City to dig out the slips. On May 18, 1904, the dredge was returned to the work and commenced operations at station 0+6, cleaning up to 25 feet, preparatory to sweeping.

Material removed.

	Cubic yards.
From prescribed cross section	683, 657
Total to date, prescribed cross section	3, 143, 097

Very respectfully, your obedient servant,

E. M. Hartrick, *Assistant Engineer.*

Capt. Edgar Jadwin, *Corps of Engineers.*

U 4.

IMPROVEMENT OF GALVESTON SHIP CHANNEL AND BUFFALO BAYOU, TEXAS.

The object of this improvement is to provide the city of Houston with a waterway to Galveston and the Gulf of Mexico, having a channel depth of 25 feet. (Annual Report of Chief of Engineers for 1898, p. 1516 et seq.)

This work formerly consisted of two separate improvements, i. e., improving ship channel in Galveston Bay, Texas (Annual Report of Chief of Engineers for 1892, p. 1536 et seq.), and improving Buffalo Bayou, Texas (Annual Report Chief of Engineers for 1891, p. 1344 et seq.).

This improvement is divided into three divisions, as follows:

Division 1.—Through the open water of Galveston Bay and the Morgan Canal is 25½ miles in length and divided into two subdivisions, the first subdivision extending from 25 feet of water in Bolivar Roads through Red Fish bar to ship channel beacon 11, a distance of 13¾ miles; and the second subdivision extending from ship channel beacon 11 to the northerly end of Morgan Canal, a distance of 11¾ miles.

Division 2.—From the north end of the Morgan Canal to Harrisburg, Tex., and is 24 miles in length.

Division 3.—From Harrisburg to the mouth of White Oak Bayou in the city of Houston, Tex., a distance of 9¼ miles. No work has been done on this portion of the improvement.

OPERATIONS DURING THE YEAR.

Active operations were carried on during the fiscal year under contract entered into February 9, 1903, and approved March 2, 1903, with the Bowers Southern Dredging Company, of Galveston, Tex.

DIVISION 1—FIRST SUBDIVISION.

One million one hundred and sixty-three thousand three hundred and ninety-eight and seventy-eight one-hundredths cubic yards of material were excavated, as per prescribed cross section, 18½ feet deep and 150 feet wide, and 184,530.70 cubic yards were excavated below prescribed cross section from station 0 (ship-channel beacon 11) to station 31+5, a distance of 31,500 feet.

DIVISION 1—SECOND SUBDIVISION.

Two million three hundred and thirty-two thousand ninety-seven and forty-four hundredths cubic yards of material were excavated as per prescribed cross section, 18½ feet deep and 150 feet wide, and 311,554.02 cubic yards below prescribed cross section, from the upper end of Morgan Canal to ship-channel beacon 11 except from station 3+0 to 15+835, which was dredged during fiscal year ending June 30, 1903.

This subdivision has now been dredged for its entire length to a least depth of 18½ feet and 150 feet wide at bottom.

Surveys made in advance of the dredge working under the present contract, in division 1, show a considerable filling in the channel, 70 feet wide and 17 feet deep, dredged in 1901–2. This filling averaged 4.3 feet in depth in twenty months and required the redredging of approximately 1,118,200 cubic yards of soft material under the present contract. Consequently, the original dredging that should be done with the money available is decreased by the above large yardage, which is about 20 per cent of the estimated total to be done under the present contract.

From appropriations that may be made for the maintenance of this channel or for the further deepening of same under the present project it would be most advisable and advantageous for the United States to acquire a dredge and excavate the soft filled-in material by hired labor, at a cost not greater than one-third the present contract prices.

DIVISION 2.

Nine hundred and sixteen thousand two hundred and fifty-nine cubic yards of material were excavated, as per prescribed cross section, 18½ feet deep and 150 feet wide, and 236,919 cubic yards below prescribed cross section, Morgan Point to station 72+020, a distance of 70,520 feet, and from station A (mile 23½ at Harrisburg) to station A3+940 (mile 22¾ near Clinton), a distance of 3,940 feet, making a total distance dredged of 74,460 feet.

A detailed account of the work done during the fiscal year will be found in the reports of Mr. E. M. Hartrick and Mr. R. B. Talfor, assistant engineers, forwarded herewith, to which attention is invited.

The balance available on June 30, 1904, and additional appropriation recommended, is proposed to apply to dredging in divisions 1 and 2.

Amount expended on these improvements to June 30, 1904, $1,872,446.53.

Money statement.

July 1, 1903, balance unexpended	$744, 083. 61
Amount appropriated by sundry civil act approved April 28, 1904	200, 000. 00
	944, 083. 61
June 30, 1904, amount expended during fiscal year, for works of improvement	438, 763. 25
July 1, 1904, balance unexpended	505, 320. 36
July 1, 1904, outstanding liabilities	75, 283. 13
July 1, 1904, balance available	430, 037. 23
July 1, 1904, amount covered by uncompleted contracts	329, 317. 06
Amount (estimated) required for completion of existing project	2, 700, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	400, 000. 00
Submitted in compliance with requirements of sundry civil act of June 4, 1897	

ABSTRACT OF APPROPRIATIONS.

Galveston ship channel and Buffalo Bayou.

By act of—	
March 3, 1899	$300, 000
June 13, 1902	300, 000
March 3, 1903	500, 000
April 28, 1904	200, 000
Total	1, 300, 000

Ship channel in Galveston Bay, Texas.

By act of—	
June 10, 1872	$10, 000. 00
June 23, 1874	10, 000. 00
March 3, 1875	35, 200. 00
August 14, 1876	72, 000. 00
June 18, 1878	75, 000. 00
March 3, 1879	80, 000. 00
June 14, 1880	50, 000. 00
March 3, 1881	50, 000. 00

By act of—	
August 2, 1882	$94, 500. 00
August 11, 1888	100, 000. 00
September 19, 1890	132, 316. 85
July 13, 1893	40, 000. 00
August 18, 1894	50, 000. 00
June 3, 1896	50, 000. 00
Total	849, 016. 85

Buffalo Bayou, Texas.

By act of—	
March 3, 1881	$25,000
August 2, 1882	50,000
July 2, 1884	25,000
August 5, 1886	18,750
August 11, 1888	25,000
September 19, 1890	25,000
July 13, 1892	$25,000
August 18, 1894	15,000
June 3, 1896	20,000
Total	228,750

In addition to the above appropriations by Congress 4 cents have been received from the sale of condemned property.

CONTRACTS IN FORCE DURING THE FISCAL YEAR.

Contractor: Bowers Southern Dredging Company, Galveston, Tex.
Character of work: Dredging.
Rates: Division 1, 8.8 cents per cubic yard; division 2, 14 cents per cubic yard.
Date of approval: March 2, 1903.
Date of beginning work: June 14, 1903.
Date of expiration: December 31, 1904.

COMMERCIAL STATISTICS.

The only commercial statistics that could be obtained for the fiscal year was the amount carried by the Direct Navigation Company, as follows:

Vessels using the bayou and ship channel, 20 (4 steam vessels and 16 barges); average length, 139 feet; average depth, 6 feet 3 inches.

Articles.	Quantity.	Approximate value.
	Tons.	
Cotton (404,308 bales)	106,417.07	$18,193,500.00
Coal	1,709.00	11,108.50
Lumber (ash, oak, and pine)	364.00	5,460.00
Bank sand	663.00	241.20
Cement	556.00	11,120.00
Green coffee	105.00	24,192.00
San Jacinto sand	465.00	207.00
Cotton bagging	801.00	66,470.00
Roofing slate	104.00	2,080.00
Piling	130.00	1,560.00
Plaster	15.00	300.00
Switch material	29.00	1,800.00
Cotton ties	150.00	2,250.00
Roof paper	16.00	3,000.00
Canned goods	316.50	26,845.00
Total	111,840.57	18,350,133.70

For number of vessels and tonnage passing through Morgan Canal, see report on operating and care of Morgan Canal (Appendix U 5, p. 1992).

REPORT OF MR. R. B. TALFOR, ASSISTANT ENGINEER.

GALVESTON, TEX., *July 3, 1904.*

CAPTAIN: I have the honor to submit the following report of dredging operations for "The Galveston Ship Channel and Buffalo Bayou Improvement," Texas, division 1, for the fiscal year ending June 30, 1904.

PROGRESS OF THE WORK.

Prior to any improvement the natural channel had a depth of not more than 7½ feet at the shoalest places; at the beginning of the fiscal year a dredged channel 17 feet deep and 70 feet bottom width had been completed from Morgan Canal to the 17-foot depth in Bolivar Roads, a distance of about 25 miles. In the upper bay the above 70-foot channel had at the beginning of the year been widened to 150 feet on the bottom with a least depth of 18½ feet for a distance of 12,000 feet, beginning 3,000 feet from the head of Morgan Canal (station 0) and running toward ship channel beacon 11, which is about 2 miles north of Red Fish reef. The project contemplates in division 1 a channel 150 feet wide on the bottom and 25 feet deep at mean low tide, with side slopes of from 1 on 2 to 1 on 4, according to the character of the bottom. At the end of the past year (June 30, 1904) a channel from the upper end of Morgan Canal to station 31+5 in the lower bay, a distance of 17.8 miles has been excavated 150 feet wide on the bottom with a least depth of 18½ feet.

Division 1 is divided into two subdivisions, as follows: Subdivision 1 extends from 25 feet of water in Bolivar Roads to ship channel beacon 11 (south end of pile dike), a distance of 13¾ miles; subdivision 2 extends from ship channel beacon 11 (south end of pile dike) to the northerly end of Morgan Canal, a distance of 11¾ miles. (See sketch herewith for location of division 1 of ship channel.)

OPERATIONS DURING THE FISCAL YEAR.

First subdivision.—1,163,398.78 cubic yards of material have been excavated to the prescribed depth, viz, 18½ feet, and 150 feet wide at bottom, 184,530.70 cubic yards below the prescribed depth from station 0 (ship channel beacon 11) and station 31+5, a distance of 31,500 feet.

Second subdivision.—2,332,097.44 cubic yards of material have been excavated to the prescribed depth, viz, 18½ feet, and 150 feet wide at bottom, 311,554.02 cubic yards below the prescribed depth from the upper end of Morgan's Canal to ship channel beacon 11, except from station 3+0 to 15+835 which was excavated and reported on in preceding annual report.

Statement of material excavated and cost of removing same during year ending June 30, 1904.

Location.	Quantity.	Rate per cubic yard.	Total cost.
Subdivision 1:	*Cubic yards.*	*Cents.*	
Prescribed cross section	1,163,398.78	8.8	$102,379.09
Below prescribed cross section	184,530.70	4.4	8,119.35
Total	1,347,929.48	....	110,498.44
Subdivision 2:			
Prescribed cross section	2.332,097.44	8.8	205,224.57
Below prescribed cross section	311,554.02	4.4	13,708.38
Total	2,643,651.46	....	218,932.95

Tides.—In the upper bay north of Red Fish bar the mean daily rise and fall is about 0.5 of a foot; in the lower bay south of Red Fish bar it is about 1.3 feet. These tides are greatly modified by the winds, those from the easterly quadrant causing tides from 2 to 4 feet above the plane of mean low tide, while those from the northerly and westerly quadrants lower the water in the bays from 1 to 2½ feet below.

Dumps.—In the lower bay (subdivision 1) the material excavated between stations 17+1 and 30+0, a distance of 12,900 feet, consisting of mud, sand, and shell, was deposited by dump scows from 2,000 to 3,000 feet west of the line of cut. The balance of the material excavated was deposited through a pipe line from 900 to 1,050 feet to the westward of the cut.

In the upper bay (subdivision 2) the material excavated was all deposited through a pipe line back of the brush and pile dike to the eastward of the channel.

SHOALING OF THE DREDGED CHANNEL.

From the beginning of the dredging operations (April 22, 1901) to June 30, 1904, and as the work progressed, a profile along the axis of the 17-foot cut was made, from which the following tables give the amount of silting in the different sections of the cut. They show that in subdivision 1 between stations 0+0 and 37+5 an average fill of 281,100 cubic yards has taken place.

In subdivision 2, 609,200 cubic yards, or a total of 890,300 cubic yards, from Morgans Point to station 37+5 (in lower bay), a distance of 19 miles. From 37+5 (lower bay) to station 54+0 (ship channel beacon 3) an approximate estimate of fill for this distance, 16,500 feet, gives an additional 227,900 cubic yards, making in all about 1,118,200 cubic yards of shoaling. A great amount of this shoaling, especially where the bottom is composed of mud, is no doubt due to the tugs passing along the sides of the cut instead of the center of it, their propellers stirring up the mud, which deposits in the cut. With a channel, 150-foot bottom width, and the confining of the tugs navigating it to its center, the silting up of the channel would be materially lessened.

From observations of previous work of this nature (dredged channels in open bays), it has been demonstrated that a fill of about 40 per cent usually follows the first cut.

Statement showing average amount of shoaling for various periods and at different points of 70-foot cut of division 1, ship channel and Buffalo Bayou improvement.

FIRST SUBDIVISION.

From—	Distance.	Date when dredged to 17-foot depth.	Date when cross sectioned before dredging to 18½ feet.	Length of time intervening.	Average fill.	Amount excavated because of fill in 70-foot channel.
	Feet.			*Months.*	*Feet.*	
Station 0+5 to 4+5	4,000	July, 1902	Mar., 1904	20	4.3	44,600
Station 4+5 to 18+5 [a]						
Station 18+5 to 22+5	4,000	Jan., 1902	Apr., 1903	15	1.8	18,700
Station 22+5 to 28+5	6,000	Feb., 1902	Nov., 1903	21	4.6	71,500
Station 28+5 to 31+5	3,000	.....do.....	Dec., 1903	22	5.6	43,600
Station 31+5 to 37+5	6,000	Mar., 1902	July, 1904	28	6.6	102,700

SECOND SUBDIVISION.

From—	Distance.	Date when dredged to 17-foot depth.	Date when cross sectioned before dredging to 18½ feet.	Length of time intervening.	Average fill.	Amount excavated because of fill in 70-foot channel.
Station 5+0 to 15+0	10,000	June, 1901	Apr., 1903	22	2.6	67,400
Station 15+0 to 25+0	10,000	Sept., 1901	May, 1903	20	3.8	98,500
Station 25+0 to 35+0	10,000	Dec., 1901	Oct., 1903	22	5.2	134,800
Station 35+0 to 45+0	10,000	Feb., 1902	Dec., 1903	22	4.8	124,400
Station 45+0 to 55+0	10,000	Mar., 1902	Oct., 1903	19	4.3	111,500
Station 55+0 to 62+0	7,000	Apr., 1902	Aug., 1903	16	4.0	72,600

[a] No shoaling between these points; cut through Red Fish bar.

Approximate estimate of fill between stations 37+5 and 54+0 (beacon 3, lower bay)	227,900
Total amount of shoaling in subdivision 1, as far as has been determined	281,100
Total amount of shoaling in subdivision 2, as far as has been determined	609,200
Total	1,118,200

From station 27+0 to 37+5 when dredge completed operation in March, 1902, the bottom was practically of uniform depth (17 feet least depth). From data obtained in December, 1903, the following results were obtained from station 27+0 to 31+5, a distance of 4,500 feet, an average depth of 11.4 feet is found in the 70-foot cut—it having shoaled 5.6 feet or 65,300 cubic yards in this distance.

July, 1904, 7 months later: From station 31+5 to 37+5, a distance of 6,000 feet, an average depth of 10.2 feet is found in the 70-foot cut, it having shoaled 6.8 feet or 105,800 cubic yards in the 6,000 feet.

Very respectfully submitted.

R. B. Talfor,
United States Assistant Engineer.

Capt. Edgar Jadwin,
Corps of Engineers.

REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

Galveston, Tex., *July 8, 1904.*

Captain: I have the honor to submit the following report for improving division 2, Galveston ship channel and Buffalo Bayou, Texas, during the fiscal year ending June 30, 1904.

PROGRESS OF THE WORK.

Division 2 extends from Morgan Canal to Harrisburg, a distance of about 24 miles. From Morgan Canal to Lynchburg, through San Jacinto Bay, a distance of 9 miles, navigation is easy for a depth of 12 feet, as there are no difficult or abrupt bends. From Lynchburg to Harrisburg, through Buffalo Bayou, a distance of 15 miles, the depth varies from 12 to 20 feet, with a maximum of 30 feet, but the sharp turns and bends make it difficult for seagoing vessels to navigate. The variation of water surface is about one-half foot at canal to 12 or more feet in Buffalo Bayou, according to condition at time of flood.

On February 9, 1903, a contract was entered upon and approved March 2, 1903, with the Bowers Southern Dredging Company, of Galveston, Tex., for dredging divisions 1 and 2, the work to commence on or before June 14, 1903, and to be completed on or before December 31, 1904. In division 2 the depth to be 18½ feet and width at bottom 100 feet, with side slopes 1 on 2.

CONDITION OF WORK.

At the beginning of the fiscal year 73,455 cubic yards of material had been removed and the channel completed 100 feet wide at bottom and over 18½ feet deep between stations 0 and 1 + 5, a distance of 1,500 feet, with an incomplete portion, 1,500 feet long, between stations 1 + 5 and 3.

At the end of the fiscal year 1,191,970 cubic yards of material had been excavated and removed, completing a channel of prescribed width, 100 feet, and over 18½ feet deep between station 0, the north end of Morgan Canal, and station 72 + 020, 13.6 miles above. Thence an incomplete portion to station A3 + 940 (mile, 23½), where the full depth and width again begins and is carried to station A (mile, 22¾), making a total length of completed channel of 75,960 feet.

About one-half of the present contract has been completed and one-sixth of the project.

OPERATIONS DURING THE YEAR.

At the beginning of the year dredge *No. 7* was at work. In August, 1903, dredge *No. 4* relieved *No. 7*. On January 6, 1904, *No. 4* was removed from the work, and in February, 1904, the *No. 7* and *Atlantic* were placed on the work, the *Atlantic* continuing upstream where the *No. 4* left off and the *No. 7* excavating from Harrisburg down.

Amount of material excavated by each dredge during the year.

	Cubic yards.
Dredge *No. 7* (20-inch)	278,696
Dredge *No. 4* (15-inch)	282,336
Atlantic (26-inch)	630,938

Statement of material excavated and removed, with cost of same, during the year ending June 30, 1904.

Location.	Quantity.	Rate per cubic yard.	Total cost.
	Cubic yards.	*Cents.*	
Prescribed cross section	916,259	14	$128,276.26
Below prescribed cross section	236,919	7	16,584.33
Total	1,153,178		144,860.59

The above material was removed between station 1 + 5 at Morgan Point and station 72 + 020 (13.6 miles above in Buffalo Bayou), a distance of 70,520 feet. Also between station A (mile 23½ at Harrisburg) and station A3 + 940 (mile 22¾ near Clinton), a distance of 3,940 feet, making a total channel length of 74,460 feet, 100 feet wide at bottom and over 18½ feet deep.

In the vicinity of mile 23, just below Harrisburg, a quicksand was encountered, which caused extra excavation to contractor and banks to cave. There was also a little trouble in keeping the spoil from returning to bayou, but it has been overcome in a great measure by constructing proper bulkheads across the gullies and carrying the pipe line farther back on the bank.

Thirty-five rights of way have been received and recorded, and a special map started to facilitate checking up of the land donated to the Government for excavating and dumping purposes.

The hydrographical and topographical survey of division 2 was continued and field work was completed, cross sections plotted, and quantities taken out as the work progressed.

Very respectfully, your obedient servant,

E. M. Hartrick, *Assistant Engineer.*

Capt. Edgar Jadwin,
Corps of Engineers.

U 5.

OPERATION AND CARE OF MORGANS CANAL, TEXAS.

A watchman was stationed at the canal during the year to enforce the regulations governing the navigation of the canal.

Condition of canal.—Sheet-piling bulkhead on the west side of canal is in a fairly good condition, and on the east side above the mean low-tide line is rotten and gradually breaking away, although the submerged part shows very little deterioration from the teredo or rot.

On January 2, 1904, about 620 feet of the old bulkhead, between stations 1+580 and 2+2, and 450 feet of barbed-wire fence that marks the eastern boundary line of the canal reservation was destroyed by fire. This destruction was caused by a prairie fire which ignited five oil-storage tanks belonging to the Bowers Southern Dredging Company, the burning oil from the tanks running down the banks into the canal.

The depth of water in the canal is 18½ feet.

The amount expended during the fiscal year was as follows:

James A. Black, salary for twelve months	$360.00
Rubber stamps for office use	.40
Total	360.40

Money statement.

July 1, 1903, balance unexpended	$391.30
June 30, 1904, amount expended during fiscal year	360.40
July 1, 1904, balance unexpended	30.90
July 1, 1904, outstanding liabilities	30.00
July 1, 1904, balance available	.90

ABSTRACT OF ALLOTMENTS.

December 2, 1896	$240
July 16, 1897	360
July 1, 1898	360
July 1, 1899	360
July 14, 1900	360
June 11, 1901	$5,000
July 18, 1902	360
June 24, 1903	360
Total	7,400

COMMERCIAL STATISTICS.

Number and tonnage of vessels passing up and down through Morgans Canal during the fiscal year ending June 30, 1904, as reported by the watchman at the canal.

	Number.	Registered tonnage.
Vessels engaged in carrying freight	1,453	108,121
Vessels in the employ of the United States or its contractors	1,642	21,399
Total	3,095	129,520

U 6.

IMPROVEMENT OF TRINITY RIVER, TEXAS.

OPERATIONS DURING THE YEAR.

SECTION 1.

Section 1, comprising a distance of 49.7 miles immediately below Dallas, Tex., was cleaned of snags and overhanging trees. Two drifts of large size, which had obstructed the river for many years, were cut out.

This portion of the river is now navigable during rises, subject to limitation from certain bridges of low elevation; and no further work, except that of maintenance, will be required.

A profile and other data were taken and preliminary location of locks and drawing made for the information of the Board of Engineers convened in accordance with the provisions of the river and harbor act, approved June 13, 1902.

The report of the Board of Engineers is contained in House Document No. 118, Fifty-eighth Congress, second session, and is herewith in Appendix U 16.

TOPOGRAPHY OF SECTION 1.

Section 1 commences at Dallas, 512½ miles from the mouth of the river, and extends downstream about 49 miles to the mouth of East Fork, just above the Texas Midland Railway bridge. The fall from the Commerce street shoal at Dallas to the shoal about 1,000 feet below East Fork is 63.6 feet, or about 1.3 feet per mile. This portion of the river is narrow and of small low-water discharge, which in periods of extended drought would be insufficient for navigation.

For about 35 miles from the upper end the banks are low, rising from 15 to 18 feet above low water; but from there to the end of the section they become gradually higher, reaching an elevation of 27 or 28 feet at the mouth of East Fork. At Dallas the stream is bordered by narrow bottom lands. These increase farther down the river to a width of several miles.

There is a total of 10 railway and highway bridges in this section which would have to be changed into draw spans in order to permit navigation at all stages.

PROCURING OF DATA.

To procure the gauge readings, etc., required for the Board of Engineers, convened in accordance with provisions of the river and harbor act, approved June 13, 1902, gauges were set up and gauge tenders appointed at the Commerce Street Bridge, at Dallas, at Hutchins bridge, about 18 miles below Dallas, and at the Texas Midland Railway bridge, just below the mouth of East Fork. The gauge readings and the discharge measurements have been made more complete for the Dallas station than for the others, as the pool there would govern through navigation in section 1. If this pool were very low, no boat could reach Dallas, even if the pools below were running over. Moreover, there are no tributaries of any low-water value in this section. Hence navigation must depend entirely upon the water passing Dallas.

For the general location of the river the maps of the survey of 1894–95 were used, but a new and careful profile was made of the whole section, showing the elevations of the bed and banks. From this the lock sites were located.

SUPPLY OF WATER.

The gauge readings available to show the discharge of the river at Dallas, which, as mentioned above under heading "procuring of data," must govern the period of navigation, extended, for the use of the Board, only over the twelve months ending October 17, 1903. Ordinary low water on the Government gauge is at 2 feet, so that a reading of 3 feet will give a depth of about 1 foot on the shoals. The following table gives a summary of the observations for discharge at this station:

Gauge reading.	Discharge per second.	Gauge reading.	Discharge per second.
Feet.	*Cubic feet.*	*Feet.*	*Cubic feet.*
2.0	[a]10.0	3.5	91.0
2.5	26.1	4.0	126.0
2.9	55.0	4.5	168.0
3.0	63.0	5.0	237.0
3.2	75.0		

[a] Low water.

These discharges (except for 2.9 and 3.2 feet, which were obtained by interpolation) were measured by floats on a base line of 100 feet, three floats being used, one in the center and one on each side, three different observations being taken for each stage where practicable. The results given are the mean of these observations less 10 per cent for friction of bed, etc.

It was assumed that the supply of water would be reduced by three elements, leakage at the locks and dams, evaporation, and the water used in lockages. No allowance was made for loss by seepage. Subsequent borings near the mouth of the river have shown that at that point the usual top stratum of clay is underlaid by sand of unknown depth.

In estimating the leakage, it was assumed that a space of one-sixteenth inch will exist around each of the four bear-trap valves, and along the lower hinge of each bear trap; a space of one thirty-second inch around each of the eight butterfly-gate valves; and a space of one-eighth inch at the ends of each bear trap. The head has been taken as 11½ feet. Special care would be necessary in fitting all movable parts. On this basis the leakage was found to be 39.1, or, in round numbers, 40 cubic feet per second.

Evaporation, assuming the Dallas pool to be 15 miles long, with an average width of 100 feet, would cause with a decrease of three-tenths inch per day during the summer months, a loss of 198,000 cubic feet per day or 2.3 cubic feet per second. At one of storage reservoirs of the Dallas waterworks, the daily loss from seepage and evaporation during the practically dry month of August, 1903, was 0.42 inches per day.

Supposing that there are ten lockages per day we need approximately for Lock No. 1, 170 by 50 by 11½ feet equals 97,750 cubic feet per lockage, or a total per day of 977,500 cubic feet, equivalent to 11.3 cubic feet per second.

The total amount of water required would therefore be (per second):

	Cubic feet.
Leakage	40
Evaporation	2.3
10 lockages	11.3
Total	53.6

If we assume the leakage as 50 cubic feet per second, and there are 20 lockages a day, the water required becomes (per second):

	Cubic feet.
Leakage	50
Evaporation	2.3
20 lockages	22.6
Total	74.9

From the table of discharges it is seen that a stage of 2.9 feet on the gauge, or 0.9 feet on the shoals, would supply enough water for 10 lockages a day, and that a stage of 3.2 feet on the gauge would supply enough for 20 lockages and 25 per cent increase of leakage per day.

The number of days on which these stages were found is as follows:

Month.	Days at 2.9 or above.	Days below 2.9.	Days at 3.2 or above.	Days below 3.2.
1902.				
October 18–31	2	12	2	12
November	27	3	27	3
December	28	3	27	4
1903.				
January	18	13	17	14
February	28	0	28	0
March	31	0	31	0
April	27	3	23	7
May	7	24	5	26
June	26	4	21	9
July	29	2	25	6
August	14	17	9	22
September	0	30	0	30
October 1–17	17	0	17	0
Total	254	111	232	133

A certain amount of storage water, about 24,000,000 cubic feet, would be available for use from the Dallas pool without interfering with the navigation of boats drawing 4 feet or less, since a least depth of 7 feet is afforded at Dallas at pool stage. When the discharge of the river fell below the amount required for the working supply, this storage, which is equivalent to about five days' supply at 55 cubic feet per second, could be gradually drawn on to supplement the natural flow. Thus where two rises were separated by a short period of low water, as between December 29, 1902, and January 1, 1903, when the flow was less than equivalent to 10 lockages per day, this amount of navigation could still have been accommodated. During the year measurements were taken for the Board.

The Board estimated that eight months' navigation could be secured, but at a cost several times greater than had previously been believed possible. The majority of the Board submitted an adverse report on the improvement, which was concurred in by the Chief of Engineers.

The observations have since been continued daily, but have not been nearly as favorable for navigation as those obtained for the Board.

The following table shows that out of the next five and one-half months, which practically comprised the cotton season for the past year, there was not sufficient water to maintain 6-foot navigation two months in the system proposed:

Statement of days gauge at Dallas, Tex., showing stage of water at or above 2.9 feet, at Dallas, Tex., from October 18, 1903, to June 30, 1904.

Month.	Days at 2.9 or above.	Days below 2.9.
1903.		
October 18–31	8	6
November	9	21
December	0	31
1904.		
January	8	23
February	10	19
March	13	18
April	30	0
May	31	0
June	30	0

NOTE.—The zero of the Government gauge at Commerce Street Bridge, from which the above is taken, is 2 feet below low water.

MOUTH TO SECTION 1.

Twenty-nine out of the 463 miles of this portion of the river were cleaned of drifts and snags between the lower end of section 1 and a point 102 miles below, and timber was cut off or trimmed out for a total distance of about 28 miles, between the end of section 1 and 166 miles below. The removal of snags was done by cutting them off to low water, as the season was favorable.

The general work has been hampered for nearly three months owing to rises in the river.

A stern-wheel launch was completed.

A survey and borings were made and plans are being prepared for a lock.

A detailed account of the work done during the fiscal year will be found in the report of Mr. D. A. Watt, assistant engineer, forwarded herewith, to which attention is invited.

Total amount expended on this improvement to June 30, 1904, $76,082.52.

The balance available on June 30, 1904, and additional appropriation recommended it is proposed to apply to snagging and cleaning section 1 and snagging and cleaning and constructing lock and dam between mouth and section 1.

Money statement.

July 1, 1903, balance unexpended		$345,723.89
Proceeds of sales of condemned property		29.77
		345,753.66
June 30, 1904, amount expended during fiscal year, for works of improvement		46,806.41
July 1, 1904, balance unexpended		298,947.25
July 1, 1904, outstanding liabilities		13,229.12
July 1, 1904, balance available		285,718.13
July 1, 1904, amount covered by uncompleted contracts		6,470.00
Amount (estimated) required for completion of existing project		3,625,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$25,000.00	
For maintenance of improvement	[a] 35,000.00	
		60,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

ABSTRACT OF APPROPRIATIONS.

By act of—	
June 13, 1902	$125,000
March 3, 1903	250,000
Total	375,000

In addition to the above appropriations by Congress there has been received $29.77 from sales of condemned property, making a total of $375,029.77.

CONTRACTS IN FORCE.

Contractor: The Charles Barnes Company, Cincinnati, Ohio.
Character of work: Furnishing and delivering engine and boiler for snag boat.
Rate: Engine, $3,450; boiler, $3,220.
Date of approval: Emergency contract.
Date of beginning work: No date.
Date of expiration: June 28, 1904.

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year could be obtained.

REPORT OF MR. D. A. WATT, ASSISTANT ENGINEER.

GALVESTON, TEX., *July 7, 1904.*

CAPTAIN: I have the honor to submit the following report of work on improving Trinity River, Tex., for the fiscal year ending June 30, 1904:

PROGRESS OF THE WORK.

The river was formerly navigated as far as Porters Bluff, about 70 miles below Dallas. On the advent of railroads, however, its commerce declined, and there is now none except occasional shipments of lumber from a mill near the mouth and some local rafting of logs.

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[a] This item is principally for continuous maintenance of snag boat. If maintained in operation it will be able to do much additional snagging and bank clearing, besides maintaining river already cleared.

The existing project, as worded in the river and harbor act of June 13, 1902, contemplated the removal of snags and other obstructions between Dallas and the mouth, a distance of about 512 miles, and the construction of locks and dams at the worst obstructions between the mouth and section 1, a distance of about 463 miles. For this work an expenditure of $400,000 was authorized. As later investigation showed that more than one lock and dam could not be built in connection with the other work directed, Congress authorized, by special act of April 28, 1904, the expenditure of as much of the funds as might be needed to construct one lock and dam between the mouth and section 1. The site for this lock has not yet been finally decided.

The water surface at Dallas is said to have reached an extreme of about 45 feet above low water, and at other points, such as Riverside, it is said to have reached nearly 60 feet.

The stream could be navigated by light-draft boats in small rises from the mouth as far as Liberty, but snags are dangerous. The draft in the tidal portion of the river is limited to about 4½ feet, owing to the bar at the mouth.

OPERATIONS DURING THE FISCAL YEAR.

SECTION 1.

Section 1, comprising a distance of 49.7 miles immediately below Dallas, was cleared of snags and overhanging timber. Two drifts of large size, which had obstructed the river for many years, were cut out.

A total of 11,747 snags were pulled out by the snag boat, and 26,174 were cut off to low-water level, and about 1,200 trees were cut down by the Government forces; the the rest of the bank clearing was done under verbal agreement. This portion of the river is now navigable during rises, subject to limitations from certain bridges of low elevation, and no further work except that of maintenance will be required.

A profile and other data were taken, and preliminary locations of locks and drawings made for the final meeting of the Board of Engineers directed by Congress to report upon "the feasibility and advisability" of expending $350,000 on this section in order to secure not less than eight months' navigation annually to Dallas.

Work on this section has cost to June 30, 1904, $44,940.82, including boats, tools, etc., or about $905 per mile.

MOUTH TO SECTION 1.

About 29 * * * miles have been cleared of drifts and snags between the lower end of section 1 and a point 102 miles below, and timber has been cut off or trimmed out for a total distance of about 28 miles between the end of section 1 and 166 miles below. Snags removed in this portion were cut off to low water, the total being 7,592, and the Government forces cut down 10,800 trees. * * *

A stern-wheel steam launch was built at Dallas, and construction begun at Texas City and the hull almost completed of a large self-propelling snag boat.

A profile survey of the river was made from the mouth to a point 134 miles above; a survey and borings made * * * for a lock * * *.

Work between the mouth and section 1 has cost to June 30, 1904, $50,840.82, including $19,699.12 for outstanding liabilities and existing contracts.

COMMERCIAL STATISTICS.

No information has been obtainable in regard to the amount of commerce. As stated above, there is none except a small amount of rafting and occasional shipments of lumber from a mill near the mouth.

Very respectfully, your obedient servant,

D. A. Watt,
Assistant Engineer.

Capt. Edgar Jadwin,
Corps of Engineers.

U 7.

IMPROVEMENT OF THE BRAZOS RIVER BETWEEN VELASCO AND RICHMOND, WEST GALVESTON BAY CHANNEL, DOUBLE BAYOU, AND THE MOUTHS OF THE ADJACENT STREAMS, INCLUDING TRINITY RIVER AND CEDAR BAYOU, TEXAS.

The object of this improvement is to obtain a navigable channel depth of from 4 to 6 feet across the bars at the mouths of most of the streams and bayous along the Texas coast. (See also H. Doc. No. 446, 56th Cong., 1st sess., reprinted as pp. 2438–2453, Annual Report of the Chief of Engineers for 1900.)

OPERATIONS DURING THE YEAR.

At canal from West Galveston Bay to the mouth of the Brazos River.

A log jam in the canal between the Brazos River and Oyster Creek was removed and a boom constructed across the mouth to prevent the return of logs and drift to the canal.

The U. S. dredge *Pigmy* excavated about 2,200 cubic yards of material. A bulkhead 52 feet long was constructed across a break in the canal bank. The dredge was repaired and snagging apparatus installed.

DREDGE GEN. H. M. ROBERT.

No work was done during the fiscal year by the dredge under this improvement.

During the fiscal year the dredge was repaired and a cutter apparatus installed.

A detailed account of the work done will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, to which attention is invited.

Amount expended on this improvement to June 30, 1904, was $107,216.35.

The balance available June 30, 1904, and additional appropriation recommended it is proposed to apply to operating the U. S. dredge *Gen. H. M. Robert* at Double Bayou, Brazos River, mouth of Trinity River, channel in West Galveston Bay, Cedar Bayou, Texas, and canal from West Galveston Bay to the mouth of the Brazos River, in dredging, snagging, etc., as may be necessary.

Money statement.

July 1, 1903, balance unexpended	$12,950.15
Proceeds of sales of condemned property	15.18
	12,965.33
June 30, 1904, amount expended during fiscal year, for works of improvement	5,166.50
July 1, 1904, balance unexpended	7,798.83
July 1, 1904, outstanding liabilities	1,833.79
July 1, 1904, balance available	5,965.04
Amount (estimated) required for completion of existing project	130,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	100,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

ASTRACT OF APPROPRIATIONS.

Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of the adjacent streams.

By act of—	
March 3, 1899	$65,000
June 13, 1902	50,000
Total	115,000

In addition to the above appropriations by Congress, there has been received from sales of condemned property $15.18, making a total of $115,015.18.

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1904, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1904.

REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

GALVESTON, TEX., *July 8, 1904.*

CAPTAIN: I have the honor to report on the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of adjacent streams during the fiscal year ending June 30, 1904.

PROGRESS OF THE WORK.

There has been very little work done, owing to the Government dredge *Gen. H. M. Robert* built to open up, extend, and maintain the coast canal and the removal of bars at the mouths of adjacent rivers, bayous, and streams not being provided with a cutter. The work in 1903–4 demonstrated the necessity of having some means to feed the stiff, sticky clay to the suction. So it was determined to install a cutter of a type best adapted for this locality. Pending the installation the *Gen. H. M. Robert* was put to work reenforcing the pile and brush dike on Pelican flats and spit where she did indifferent work, except when working in silt or sandy material.

The *Gen. H. M. Robert* on June 30 went to work with her new and improved cutter and is considered a success.

OPERATIONS DURING THE YEAR.

The waterway between West Galveston Bay and Brazos River was completely blocked by a log jam during the years following the hurricane of September 8, 1900. On the representation and complaint of those interested the jam was removed from the Galveston and Brazos Canal between the Brazos River and Oyster Creek, and to prevent a return of logs and drift to the canal a boom was constructed across its mouth.

The dredge *Gen. H. M. Robert* not being available to continue the work of clearing out the canal, the dredge *Pigmy* (8-inch pump) was supplied with a snagging outfit and the launch *Col. Riche* detailed as tender. The dredge started work on the 25th of May, 1904, at mile 38 (from Galveston), near the entrance to canal at Brazos River, and removed all obstructions, leaving a depth of 3 feet navigable water to mile 33½, with a ruling depth of 18 inches to Christmas Point. The variation of level of water surface is about 1 foot in the canal.

About 2,200 cubic yards of material have been excavated and removed, a bulkhead 52 feet long constructed across a break in canal bank at mile 33½, grass, snags, and other obstructions handled during the five weeks of intermittent operation caused by reorganization of forces, isolated location, and scarcity of suitable fuel.

* * * * * * *

Very respectfully, your obedient servant,

E. M. HARTRICK,
Assistant Engineer.

Capt. EDGAR JADWIN,
Corps of Engineers.

(A) TRINITY RIVER.

For work done on this improvement during the fiscal year, see report herewith on improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of the adjacent streams.

Amount expended on this improvement to June 30, 1904, $84,000.

ABSTRACT OF APPROPRIATIONS.

By act of—	
June 18, 1878	$10,000
March 3, 1879	2,500
June 14, 1880	4,000
March 3, 1881	10,000
August 2, 1882	8,000
August 11, 1888	12,500
September 19, 1890	10,000
July 13, 1892	$10,000
August 18, 1894	5 000
June 3, 1896	5,000
March 3, 1899	7,000
Total	84,000

COMMERCIAL STATISTICS OF TRINITY RIVER, TEXAS, FOR THE FISCAL YEAR ENDING JUNE 30, 1904.

Vessels using the river, 24 (2 steam vessels, 10 barges, and 12 sailing vessels); draft, 5 feet; total tonnage, 5,000.

Amount and value of freight transported.

Articles.		Amount.	Approximate value.
Lumber	tons	50,000	$750,000
Wood	cords	2,000	1,000
General merchandise	tons	2,000	100,000

(B) CEDAR BAYOU.

No work was done up to the close of the fiscal year.

The amount appropriated by the river and harbor act approved June 13, 1902, is to be expended in maintaining the entrance and approaches to the bayou by dredging with the U. S. dredge *Gen. H. M. Robert.*

Amount expended on this improvement to June 30, 1904, $32,150.

The available balance on June 30, 1904, it is proposed to apply to maintaining the channel by dredging with the U. S. dredge *Gen. H. M. Robert.*

Money statement.

July 1, 1903, balance unexpended	$5,000.00
July 1, 1904, balance unexpended	5,000.00
July 1, 1904, outstanding liabilities	605.77
July 1, 1904, balance available	4,394.23

ABSTRACT OF APPROPRIATIONS.

By act of—	
September 19, 1890	$18,150
July 13, 1892	14,000
June 13, 1902	5,000
Total	37,150

(C) CHANNEL IN WEST GALVESTON BAY.

OPERATIONS DURING THE YEAR.

The U. S. dredge *Pigmy* was fitted up with a snagging outfit for use in removing obstructions.

In future work on this improvement will be conducted in connection with appropriation for improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of adjacent streams. (See report herewith on improvement of the Brazos River between Velasco and Richmond, West Galveston Bay Channel, Double Bayou, and the mouths of the adjacent streams.)

The amount expended during the fiscal year was for repairing and installing cutter on the U. S. dredge *Gen. H. M. Robert*, and fitting up the U. S. dredge *Pigmy* and the U. S. launch *Col. Riche.*

A detailed account of the work done will be found in the report of Mr. E. M. Hartrick, assistant engineer, forwarded herewith, to which attention is invited.

Total amount expended on this improvement to June 30, 1904, was $20,301.49.

The balance available on June 30, 1904, it is proposed to apply to dredging and removing obstructions in the channel with United States plant.

Money statement.

July 1, 1903, balance unexpended	$5,224.03
June 30, 1904, amount expended during fiscal year, for works of improvement	525.52
July 1, 1904, balance unexpended	4,698.51
July 1, 1904, outstanding liabilities	631.18
July 1, 1904, balance available	4,067.33

ABSTRACT OF APPROPRIATIONS.

By act of—	
July 13, 1892	$15,000
August 18, 1894	5,000
June 3, 1896	5,000
Total	25,000

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1904, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1904.

REPORT OF MR. E. M. HARTRICK, ASSISTANT ENGINEER.

GALVESTON, TEX., *July 8, 1904.*

CAPTAIN: I have the honor to submit the following report of operations for improving channel in West Galveston Bay, Texas, during the fiscal year ending June 30, 1904.

CONDITION OF WORK.

No work has been done on channel through West Galveston Bay since October 2, 1895, as a greater depth of water existed in the bay than was found in Galveston and Brazos Canal.

The hurricane of September 8, 1900, wrecked the railway trestle and the wagon bridge that crossed West Bay at Virginia Point, scattering the débris over the bay, causing more or less danger to navigation by iron and wood snags submerged or slightly protruding above the surface. Beacons erected to mark the channel were also overturned, and together with the shoaling along the cuts, the channel has been very little used since the hurricane. The ruling depth is about 3 feet, and variation of level of water surface about 1½ feet.

OPERATIONS DURING THE YEAR.

Preliminary work has been done in fitting up dredge *Pigmy* with a snagging outfit, and the launch *Col. Riche* as tender. The *Col. Riche* made trips through West Bay and Galveston and Brazos Canal to determine the best point at which to begin operations. It was decided to begin work on the canal and bring it to the same navigable depth as that through West Bay, then remove snags, deepen channel, and repair and replace beacons marking the cut through West Bay.

On May 16, 1904, the dredge and snagging boat *Pigmy*, in tow of the *Col. Riche*, started from Galveston through West Bay to the Galveston and Brazos Canal, with instructions to remove all snags and obstructions to navigation in the channel through West Bay to a depth of 3 feet. The tide being high the boats found no obstructions of any consequence until they arrived off the eastern approach to the Galveston and Brazos Canal.

Very respectfully, your obedient servant,

E. M. HARTRICK,
Assistant Engineer.

Capt. EDGAR JADWIN,
Corps of Engineers.

(D) BRAZOS RIVER.

No work was done during the fiscal year.

The amount expended during the fiscal year was for repairs to the U. S. dredge *Gen. H. M. Robert* and installing cutter.

In future work on this improvement will be conducted in connection with appropriation for the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouth of adjacent streams. (See report herewith on the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay channel, Double Bayou, and the mouths of adjacent streams.)

Amount expended on this improvement to June 30, 1904, $522.78.

The balance available on June 30, 1904, it is proposed to apply to dredging and snagging with United States plant.

Money statement.

July 1, 1903, balance unexpended	$4,977.65
June 30, 1904, amount expended during fiscal year, for works of improvement	500.43
July 1, 1904, balance unexpended	4,477.22
July 1, 1904, outstanding liabilities	220.87
July 1, 1904, balance available	4,256.35

APPROPRIATION.

June 3, 1896	$5,000

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1904, could be obtained. Inquiries by letter were made, but no replies have been received to June 30, 1904.

U 8.

IMPROVEMENT OF BRAZOS RIVER, TEXAS, FROM RICHMOND TO OLD WASHINGTON.

OPERATIONS DURING THE FISCAL YEAR.

A detailed account of the work done during the fiscal year will be found in the report of Mr. D. A. Watt, assistant engineer, forwarded herewith, to which attention is invited.

About 40 miles have yet to be completed, after which the channel must be again worked over.

It is proposed to apply the balance available on June 30, 1904, and additional appropriation recommended toward the completion of all the items included in the approved project.

Amount expended on this improvement to June 30, 1904, $44,757.92.

Money statement.

July 1, 1903, balance unexpended	$137,933.08
June 30, 1904, amount expended during fiscal year, for works of improvement	32,691.00
July 1, 1904, balance unexpended	105,242.08
July 1, 1904, outstanding liabilities	2,542.14
July 1, 1904, balance available	102,699.94
July 1, 1904, amount covered by uncompleted contracts	6,470.00
Amount (estimated) required for completion of existing project	75,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	[a] 75,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

ABSTRACT OF APPROPRIATIONS.

By act of June 13, 1902	$150,000

CONTRACT IN FORCE.

Contractor: The Charles Barnes Company, Cincinnati, Ohio.
Character of work: Furnishing and delivering engines and boilers for snag boat.
Rate: Engine, $3,350; boiler, $3,120.
Date of approval: Emergency contract.
Date of beginning work: No date.
Date of expiration: July 30, 1904.

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[a] If project includes work only down to Richmond, Tex., only $50,000.

COMMERCIAL STATISTICS.

There is no commerce on this portion of the river.

REPORT OF MR. D. A. WATT, ASSISTANT ENGINEER.

Galveston, Tex., *July 7, 1904.*

Captain: I have the honor to submit the following report of work on the Brazos River, Texas, between Richmond and Old Washington, for the fiscal year ending June 30, 1904:

PROGRESS OF THE WORK.

This river was navigated, before the advent of railways as far as Old Washington, about 254 miles from the mouth, but for many years there has been no commerce except on the tidal portion.

The existing project, authorized by Congress on June 13, 1902, is for the removal of snags and other obstructions, and for the improvement of bars and shoals by training walls and dikes, between Old Washington and the mouth, a distance of about 254 miles, in order to secure a 4-foot navigation for not less than eight months a year. The estimated cost was $225,000, and for the part from Richmond to Old Washington, about 154 miles, $150,000 was appropriated.

No benefit can be derived from the work until the river is snagged from its mouth to Richmond.

The water surface varies from a depth of a few inches to more than 45 feet.

OPERATIONS DURING THE FISCAL YEAR.

During the fiscal year the floating snagging plant was completed and the river snagged, wholly or partially, depending on the stage of water, for a distance of 114 miles below Old Washington, or about four-fifths of the total distance. Some rocks were also removed. A total of about 3,000 snags were taken from the bed, and about 34,400 snags and trees cut up on the banks. About 40 miles have yet to be completed, after which the channel must be again worked over.

No training walls or spur dikes have yet been built.

A stern-wheel steam launch was completed. Construction was begun at Texas City, Tex., of a large self-propelling snag boat and the hull launched, and surveys and other preparations commenced for the construction of dikes.

To June 30, 1904, the work has cost $53,770.06. This sum includes $9,012.14 for outstanding liabilities and existing contracts.

Very respectfully, your obedient servant,

D. A. Watt,
Assistant Engineer.

Capt. Edgar Jadwin,
Corps of Engineers.

U 9.

IMPROVEMENT OF THE MOUTH OF BRAZOS RIVER, TEXAS.

Operations during the fiscal year were carried on under a contract entered into April 14, 1903, and approved May 13, 1903, with Moore & Sieber, of Texas City, Tex., the intention of the work under this contract being to reduce the danger of the Brazos River flanking the jetties, by constructing spurs in the big bend of the river above the light-house, and by reinforcing and protecting the bank of the river at and immediately above the inner end of the northeast jetty, and repairing the most serious gaps in the jetties that were caused by the hurricane of September 8, 1900.

The contractors commenced active operations on August 20, 1903, and completed contract April 5, 1904.

A detailed account of the work done during the fiscal year will be found in the report of Mr. S. W. Campbell, superintendent, forwarded herewith, to which attention is invited.

Total amount expended on this improvement to June 30, 1904, $288,339.65.

The balance available on June 30, 1904, and additional appropriation recommended, it is proposed to apply to repairing the jetties and construction of cribs and spur dikes in the river.

Money statement.

July 1, 1903, balance unexpended	$62,804.86
Proceeds of sales of condemned property	.03
	62,804.89
June 30, 1904, amount expended during fiscal year, for works of improvement	57,385.88
July 1, 1904, balance unexpended	5,419.01
July 1, 1904, outstanding liabilities	8.33
July 1, 1904, balance available	5,410.68
Amount (estimated) required for completion of existing project	275,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	275,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

ABSTRACT OF APPROPRIATIONS.

By act of—		By act of—	
June 14, 1880	$40,000	March 3, 1899	$85,000
March 3, 1881	40,000	June 13, 1902	50,000
August 2, 1882	50,000		
July 5, 1884	10,000	Total	293,750
August 5, 1886	18,750		

In addition to the above appropriations by Congress there has been received $8.66 from sales of condemned property, making a total of $293,758.66.

CONTRACTS IN FORCE.

Contractor: Moore & Sieber, Texas City, Tex.

Character of work: Repairing jetties and constructing cribs and spurs.

Rates: Small riprap placed in jetties, cribs, and spurs, $3.14 per ton; large riprap placed in jetties, $3.95 per ton; logs placed in cribs and spurs, covering all necessary iron fastenings and brush, 35 cents per linear foot.

Date of approval: May 13, 1903.

Date of beginning work: August 23, 1903.

Date of expiration: Completed April 5, 1904.

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1904, could be obtained.

Inquiries by letter were made, but no replies have been received up to June 30, 1904.

REPORT OF MR. S. W. CAMPBELL, SUPERINTENDENT.

Bolivar, Tex., *June 30, 1904.*

Captain: I have the honor to submit the following report of operations for year ending June 30, 1904, improving mouth of Brazos River, Texas.

PROGRESS OF THE WORK.

There were no soundings taken on the bar or between the jetties, as the work contemplated was for reenforcing the shore end of the northeast jetty, protecting east bank of river with cribs from station 0 of northeast jetty up to the canal, and building spurs in the big bend above the light-house so as to prevent the river flanking the jetties, east bank protected by cribs from station 0 of northeast jetty to canal, a distance of 3,498 feet. The big bend above the light-house is protected by 15 spurs.

OPERATIONS DURING THE FISCAL YEAR.

The contractors, Moore & Sieber, commenced active operations August 20, 1903.

Seventy-five thousand one hundred and seven linear feet of logs and 2,890.85 tons of riprap were used in building and fill of 119 cribs, costing $35,187.30, which were placed on east bank from station 0 of northeast jetty up to the Galveston-Brazos Canal.

Twenty-four thousand nine hundred and seventy linear feet of logs with 406.10 tons of riprap, costing $10,226.29, were used in building 15 spurs, which were placed along the right bank of the river in the big bend above the light-house.

Two thousand seven hundred and forty-six and fifty one-hundredths tons of riprap, costing $10,087.04, was used in repairing shore end of northeast jetty and in filling some of the worst gaps between station 12 and stations 40 and 41.

No commercial statistics were obtained, as only a few small schooners and sloops are at present engaged in this trade.

Very respectfully, your obedient servant,

S. W. Campbell, *Superintendent.*

Capt. Edgar Jadwin,
Corps of Engineers.

U 10.

IMPROVEMENT OF ARANSAS PASS AND BAY, TEXAS.

OPERATIONS DURING THE FISCAL YEAR.

JETTY WORK.

Work of strengthening and completing the north jetty was carried on under contract entered into April 6, 1903, and approved April 20, 1903, with Henry Clay Ripley, of Ann Arbor, Mich.

REMOVING PART OF OLD GOVERNMENT JETTY.

Work of removing part of the old Government jetty was carried on under contract entered into April 22, 1903, and approved May 13, 1903, with Moore & Sieber, of Texas City, Tex.

On June 13, 1904, the contractors reported work ready for inspection, and at close of the fiscal year same is being made.

The work under this contract secures the removal of the old Government jetty between the north jetty and a line parallel to and 800 feet from the north jetty.

Current measurements were made and flow during ebb and flood tides calculated for three cross sections: One across the gorge, section A A; one across the gap between the inner end of the jetty and the shore, section G E, and one across the channel near the middle of the jetty, section B B. A map forwarded herewith shows location of sections and data obtained.

SURVEY.

In August, 1903, before the commencement of active operations by the contractor, a survey was made from the gorge to the 36-foot curve of depth in the Gulf, with cross section of the outer end of north jetty. Bar surveys were made in the month of December, 1903, January, March, May, and July, 1904, but so far show very little, if any, improvement in the navigable waterway.

There is a decided deepening alongside the jetty between A F and at the extreme end, but on account of the lack of width and closeness to jetty is not navigable.

A map of the latest survey of the bar is herewith.

Amount expended on this improvement to June 30, 1904, $757,897.41, exclusive of $9,938.93, subscribed by the citizens of Rockport and Corpus Christi.

The balance available on June 30, 1904, and additional appropriation recommended, it is proposed to apply to repairing and extending the north jetty and removing the old Government jetty.

A detailed account of the work done will be found in the report of Mr. F. Oppikofer, assistant engineer, forwarded herewith, to which attention is invited.

Money statement.

July 1, 1903, balance unexpended	$253,622.09
June 30, 1904, amount expended during fiscal year, for works of improvement	120,269.50
July 1, 1904, balance unexpended	133,352.59
July 1, 1904, outstanding liabilities	32,791.60
July 1, 1904, balance available	100,560.99
July 1, 1904, amount covered by uncompleted contracts	97,752.10
Amount (estimated) required for completion of existing project	1,430,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	[a] 200,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897.	

ABSTRACT OF APPROPRIATIONS.

By act of—		By act of—	
March 3, 1879	$35,000	August 11, 1888	$100,000
June 14, 1880	65,000	March 3, 1899	60,000
March 3, 1881	80,000	June 13, 1902	250,000
August 2, 1882	100,000		
July 5, 1884	100,000	Total	891,250
August 5, 1886	101,250		

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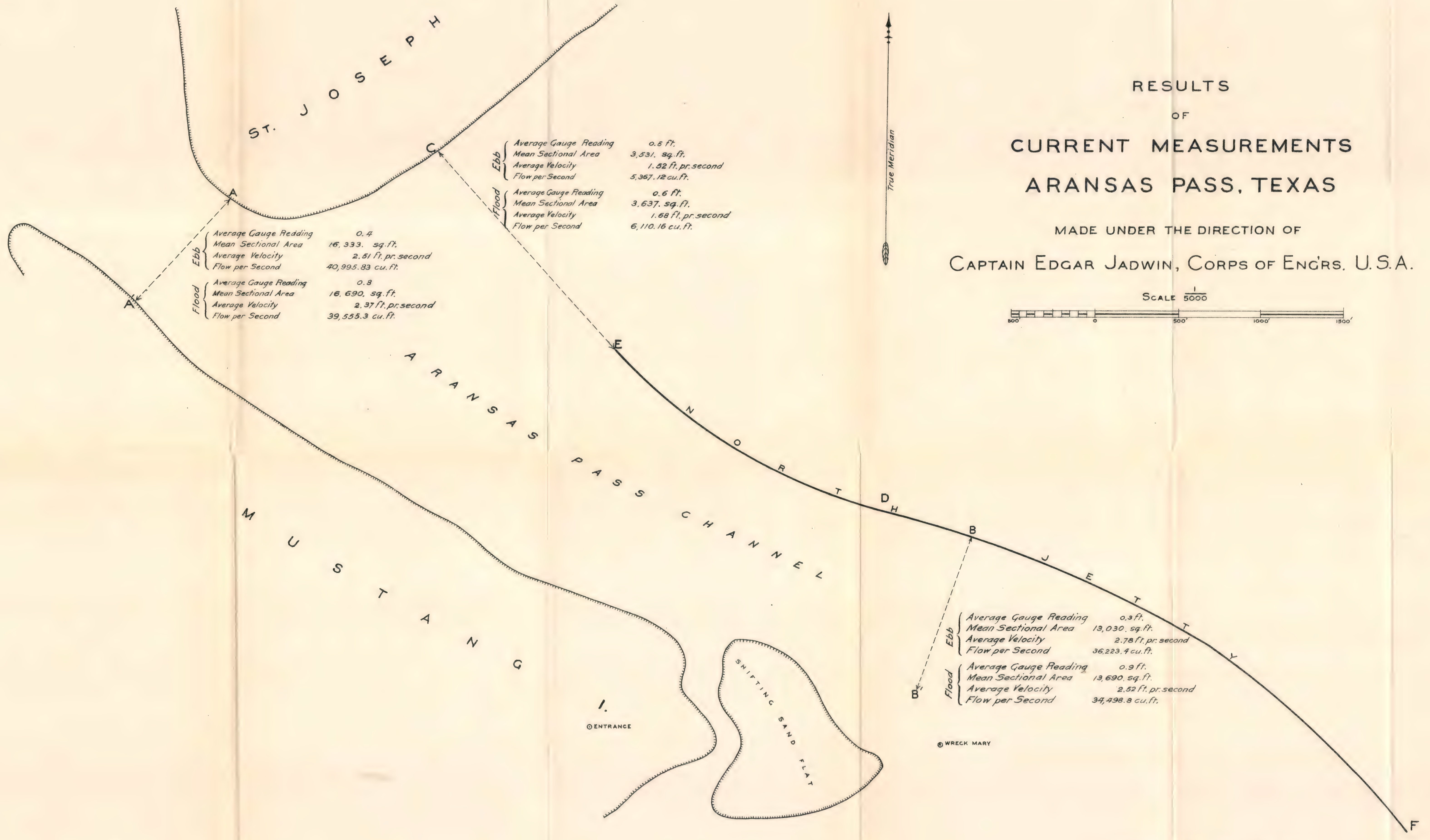
[a] If project is only for completion of Haupt Jetty. If it is intended to work on both jetties, $400,000 can be profitably expended.



RESULTS
OF
CURRENT MEASUREMENTS
ARANSAS PASS, TEXAS

MADE UNDER THE DIRECTION OF

CAPTAIN EDGAR JADWIN, CORPS OF ENG'RS. U.S.A.

SCALE $\frac{1}{5000}$

Ebb	Average Gauge Reading	0.5 ft.
	Mean Sectional Area	3,531. sq.ft.
	Average Velocity	1.52 ft.pr.second
	Flow per Second	5,367.12 cu.ft.
Flood	Average Gauge Reading	0.6 ft.
	Mean Sectional Area	3,637. sq.ft.
	Average Velocity	1.68 ft.pr.second
	Flow per Second	6,110.16 cu.ft.

Ebb	Average Gauge Redding	0.4
	Mean Sectional Area	16,333. sq.ft.
	Average Velocity	2.51 ft.pr.second
	Flow per Second	40,995.83 cu.ft.
Flood	Average Gauge Reading	0.8
	Mean Sectional Area	16,690. sq.ft.
	Average Velocity	2.37 ft.pr.second
	Flow per Second	39,555.3 cu.ft.

Ebb	Average Gauge Reading	0.3 ft.
	Mean Sectional Area	13,030. sq.ft.
	Average Velocity	2.78 ft.pr.second
	Flow per Second	36,223.4 cu.ft.
Flood	Average Gauge Reading	0.9 ft.
	Mean Sectional Area	13,690. sq.ft.
	Average Velocity	2.52 ft.pr.second
	Flow per Second	34,498.8 cu.ft.

TARPON, TEXAS. MARCH 30-1904

RESPECTFULLY SUBMITTED

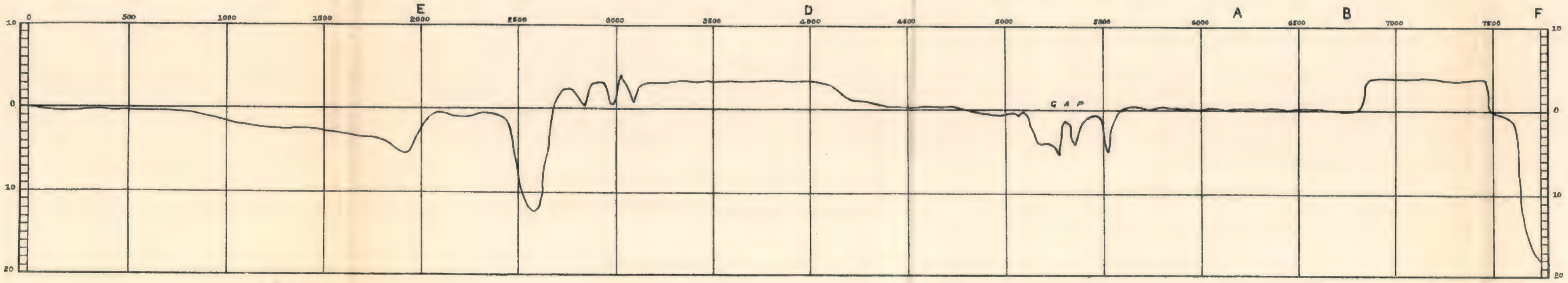
F. Oppikofer

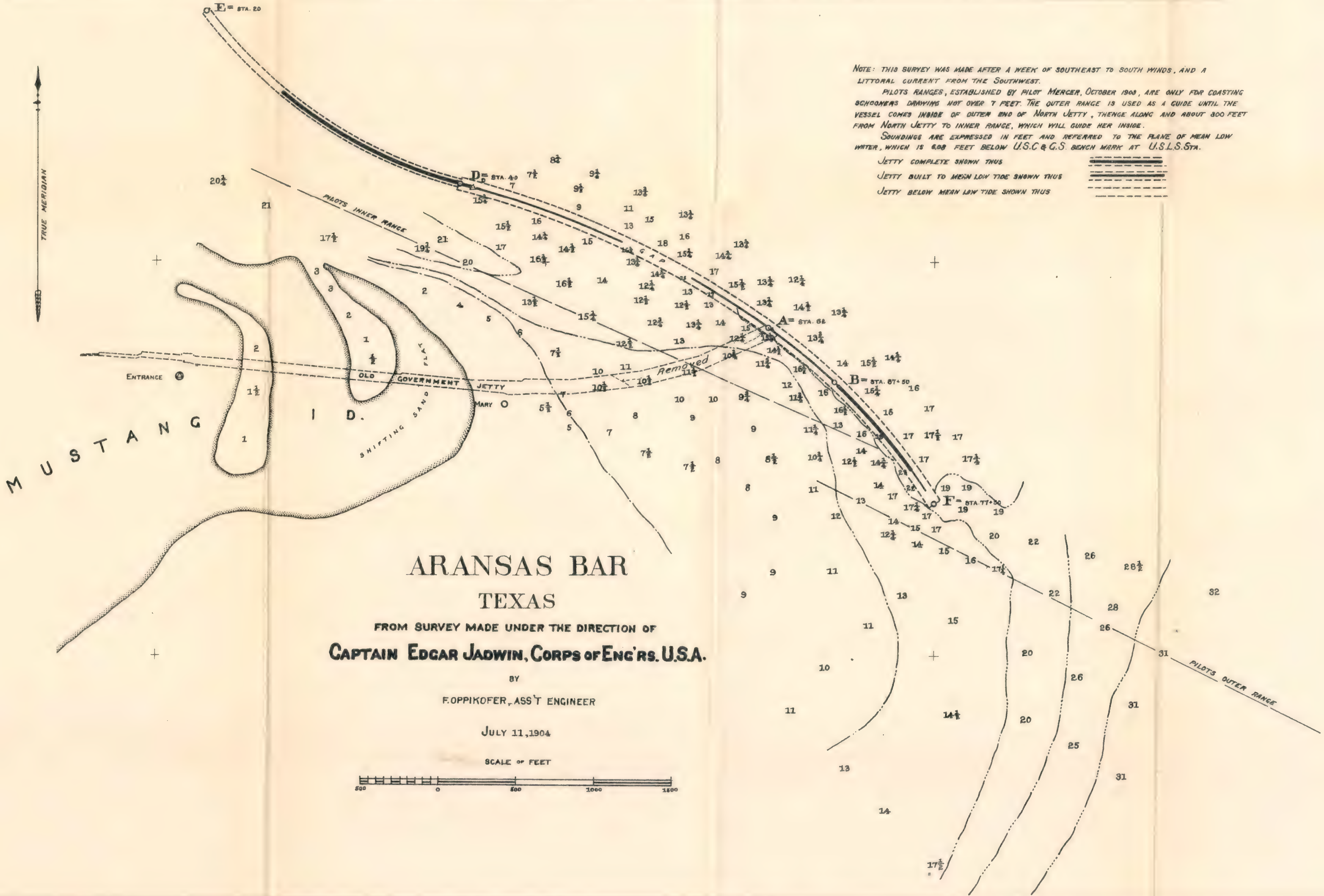
ASSISTANT ENGINEER

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D.C.

Eng 58 3

PROFILE, NORTH JETTY.





NOTE: THIS SURVEY WAS MADE AFTER A WEEK OF SOUTHEAST TO SOUTH WINDS, AND A LITTORAL CURRENT FROM THE SOUTHWEST.

PILOTS RANGES, ESTABLISHED BY PILOT MERCER, OCTOBER 1903, ARE ONLY FOR COASTING SCHOONERS DRAWING NOT OVER 7 FEET. THE OUTER RANGE IS USED AS A GUIDE UNTIL THE VESSEL COMES INSIDE OF OUTER END OF NORTH JETTY, THENCE ALONG AND ABOUT 300 FEET FROM NORTH JETTY TO INNER RANGE, WHICH WILL GUIDE HER INSIDE.

SOUNDINGS ARE EXPRESSED IN FEET AND REFERRED TO THE PLANE OF MEAN LOW WATER, WHICH IS 6.08 FEET BELOW U.S.C & G.S. BENCH MARK AT U.S.L.S.STA.

JETTY COMPLETE SHOWN THUS

JETTY BUILT TO MEAN LOW TIDE SHOWN THUS

JETTY BELOW MEAN LOW TIDE SHOWN THUS

ARANSAS BAR

TEXAS

FROM SURVEY MADE UNDER THE DIRECTION OF

CAPTAIN EDGAR JADWIN, CORPS OF ENG'RS. U.S.A.

BY

F. OPPIKOFER, ASS'T ENGINEER

JULY 11, 1904

SCALE OF FEET

500 0 500 1000 1500

THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON, D. C.

CONTRACTS IN FORCE DURING FISCAL YEAR.

Contractor: Henry Clay Ripley, Ann Arbor, Mich.
Character of work: Jetty.
Rates: Small riprap placed in the jetty, $3.75 per ton; large riprap (granite) placed in the jetty, $4.60 per ton; large riprap obtained in the quarrying of small riprap placed in the jetty, $4.25 per ton; large block placed in the jetty, $5.10 per ton.
Date of approval: April 20, 1903.
Date of beginning work: July 23, 1903.
Date of expiration: Time limit extended to August 31, 1904.

Contractor: Moore & Sieber, Texas City, Tex.
Character of work: Removing portion of old Government jetty.
Rates: $46,000.
Date of approval: May 13, 1903.
Date of beginning work: August 23, 1903.
Date of expiration: Time limit extended to August 31, 1904.

COMMERCIAL STATISTICS OF ARANSAS PASS, TEX., FOR FISCAL YEAR ENDING JUNE 30, 1904.

Articles.	Quantity.	Approximate value.
	Tons.	
Cotton (2,070 bales)	517.5	$124,200
Hides and skins	52.5	7,350
Wool	12.5	3,750
General merchandise	1,003.0	645,932
Lumber	13,816.0	165,792
Total	15,401.5	947,024

REPORT OF MR. F. OPPIKOFER, ASSISTANT ENGINEER.

TARPON, TEX., *July 1, 1904.*

CAPTAIN: I have the honor to submit the following report on progress of the work at Aransas Pass, Tex., for the fiscal year ending June 30, 1904:

The depths over Aransas bar have varied greatly, from 9 feet in 1852, 9½ feet in 1871, 7 feet in 1875, to 8½ feet in 1887.

The minimum depth in the thalweg is about the same as last year, 14½ feet. Considerable scour has taken place along the south edge of the work under construction.

The pilots can bring over the bar, in ordinary high tide and with fair weather, vessels 150 feet long, drawing 10 feet. Vessels longer than 50 feet would have to draw less water.

The usual range of tide at Aransas Pass is 1.1 feet, although during times of storm this may be increased to four or five times that amount.

OPERATIONS DURING THE FISCAL YEAR.

H. C. Ripley's plant consists of two barges and one tug, the barges being equipped with derrick, hoisting gear, etc. Actual operations on the contract were commenced August 18, 1903. Up to and including June 30, 1904, the following amounts of rock were put in:

Small riprap, 20,843.71 tons, at $3.75	$78,163.91
Large riprap (limestone), 3,261.25 tons, at $4.25	13,860.30
Large riprap (granite), 11,199.27 tons, at $4.60	51,516.63
Large blocks, 809.31 tons, at $5.10	4,127.48
Total	147,668.32

In addition to this expenditure, there are yet to be taken into consideration the expenses for inspection and superintendence.

About three-fourths of the contract has been completed, 2,200 feet of riprap mound having been built to mean low tide, 2,100 feet being protected by slope rock, and 500 feet completed with crest blocks.

Actual operations under contract of Moore & Sieber began August 22, 1903. On September 2, 1903, the dredge barge burned, being a total loss. No further work was done until January 30, 1904, when operations were again resumed. Contractors' plant consists of scow-built dredge, equipped with pump, small derrick for hoisting, machinery, and quarters for force of men.

COMMERCIAL STATISTICS.

These will be forwarded as soon as received from the deputy customs collector at Corpus Christi.

Very respectfully, your obedient servant,

F. Oppikofer, *Assistant Engineer.*

Capt. Edgar Jadwin,
Corps of Engineers.

U II.

IMPROVEMENT OF HARBOR AT BRAZOS SANTIAGO, TEXAS.

No work was done during the fiscal year.

Project for expenditure of available funds was submitted.

Inspection of the harbor was made and specifications for dredging prepared.

It is proposed to expend the available funds in dredging the channel from the entrance to the wharves at Point Isabel.

The importance of this port is increasing. It is generally expected to receive a great impetus through the opening of the St. Louis, Brownsville and Mexico Railroad which has been just completed, and which connects Brownsville and Point Isabel with the general railroad systems of the country, and from the construction of links of railroad in Mexico, rendering Brazos Santiago nearest port for large section of Mexico.

Total amount expended on this improvement to June 30, 1904, $192,714.61.

Money statement.

July 1, 1903, balance unexpended	$54,836.84
June 30, 1904, amount expended during fiscal year, for works of improvement	51.45
July 1, 1904, balance unexpended	54,785.39
July 1, 1904, outstanding liabilities	40.00
July 1, 1904, balance available	54,745.39
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897.	400,000.00

ABSTRACT OF APPROPRIATIONS.

By act approved—		By act approved—	
June 14, 1880	$25,000	August 5, 1886	$37,500
March 3, 1881	75,000	August 11, 1888	25,000
August 2, 1882	60,000		
July 5, 1884	25,000	Total	247,500

COMMERCIAL STATISTICS.

No commercial statistics for the fiscal year ending June 30, 1904, could be obtained. Inquiries by letter were made, but no replies have been received up to June 30, 1904.

Comparative statement of commercial statistics of Brazos Santiago Harbor, Texas, from 1881 to 1903.

	Weight.	Remarks.
Calendar year—	*Tons.*	
1881	21,416	Statistics of Rio Grande R. R.
1882	16,950	Do.
1883	17,326	Do.
1884	15,493	Do.
1885	10,628	Do.
1886	12,680	Do.
1887	13,468	Do.
Fiscal year—		
1888	15,166	Reports of special agent.
1889	17,283	Do.
1890	22,015	Do.
1891	21,644	Do.
1892	17,495	Do.
1893	17,423	Do.
1894	13,959	Do.
1895	11,202	Do.
Calendar year—		
1896	9,850	Statistics of Rio Grande R. R.
1897	9,562	Do.
1898	6,255	Do.
1899	6,559	One steamship line.
1900	7,140	Do.
1901	Not obtained.	
1902	....do ...	
1903	11,484	Do.

U 12.

CONSTRUCTION OF SEA WALL, EMBANKMENT, AND FILL ALONG THE FRONT OF THE FORT CROCKETT RESERVATION, GALVESTON, TEXAS, AND CONSTRUCTING SEA WALL FROM THIRTY-NINTH STREET TO THE WEST LINE OF FORTY-FIFTH STREET IN THE CITY OF GALVESTON.

OPERATIONS DURING THE YEAR.

Project was submitted for the expenditure of the amount appropriated by the sundry civil act approved April 28, 1904. The project submitted was approved.

Specifications were submitted for approval.

Money statement.

Amount appropriated by sundry civil act approved April 28, 1904	$591,046.25
July 1, 1904, balance unexpended	591,046.25

ABSTRACT OF APPROPRIATIONS.

By act of April 28, 1904	$591,046.25

U 13.

PRELIMINARY EXAMINATION OF GUADALUPE RIVER, TEXAS, FROM SAN ANTONIO BAY TO AND ABOVE VICTORIA.

[Printed in House Doc. No. 187, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated May 28, 1903, by Capt. C. S. Riché, Corps of Engineers, on preliminary examination of Guadalupe River from light-draft navigable water in San Antonio Bay, first, to the city of Victoria, second, from above said city to a point whence navigation may be feasible and desirable. This examination has been made in pursuance of a requirement in the river and harbor act of June 13, 1902, and it is Captain Riché's opinion, concurred in by the division engineer, that the locality is not worthy of improvement by the General Government under present conditions.

The Board of Engineers for Rivers and Harbors has reviewed this report in pursuance of the provisions of sections 3 and 14 of the abovementioned act, and expresses the opinion in its report of July 29, 1903, that it is not desirable at the present time for the United States to undertake the improvement of Guadalupe River.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. C. S. RICHÉ, CORPS OF ENGINEERS.

United States Engineer Office,
Galveston, Tex., May 28, 1903.

General: In compliance with circular letter dated Office Chief of Engineers, June 23, 1902, I have the honor to submit the following report of preliminary examination of Guadalupe River, as required by the following item of the river and harbor act approved June 13, 1902:

> The Guadalupe River from light-draft navigable water in San Antonio Bay, first, to the city of Victoria, second above said city to a point whence navigation may be feasible and desirable.

Previous examinations of Guadalupe River were made in 1874 under the direction of Capt. C. W. Howell, Corps of Engineers (see Report Chief of Engineers for 1875, Part 1, p. 924 et seq.); in 1889, under the direction of Maj. O. H. Ernst, Corps of Engineers (see Report Chief of Engineers for 1889, p. 1577 et seq.); and in 1894, under the direction of Maj. A. M. Miller, Corps of Engineers (see Report Chief of Engineers for 1895, p. 1826 et seq.).

This latter report, after describing the then condition of the river, states:

> From the above facts it would appear that by clearing out the river a navigation of 3 feet at low water could be obtained. This would undoubtedly be valuable, and might induce or create a commerce on the river, and also by competition decrease freight rates, but such a commerce would require improvements at the mouth of the river. At present there are no facilities for such a trade, as the entrances to Aransas Pass and Matagorda Bay are not in a condition to invite remunerative navigation.

The above statement applies to-day with equal force as in 1895. Guadalupe River, if improved as outlined in the item above quoted from the river and harbor act, would form an isolated waterway. Suitable vessels that could profitably navigate it could not get from its mouth to a port where their cargoes could be transferred to ocean-going vessels. Such navigation as might be developed would therefore be very small in amount, and the effect of such improvement on freight rates and otherwise could be but slight and out of proportion to the expenditure that would be involved.

For the above reasons I feel constrained to report that the contemplated improvement of Guadalupe River is not warranted under present conditions.

* * * * * * *

Very respectfully, your obedient servant,

C. S. RICHÉ,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., June 1, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of the district engineer officer that Guadalupe River, Texas, is not worthy of improvement by the General Government under present conditions.

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
June 6, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 29, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on a preliminary examination of "the Guadalupe River from light-draft navigable water in San Antonio Bay, first, to the city of Victoria, second, above said city to a point whence navigation may be feasible and desirable," the indorsement of the division engineer thereon, and all other data available, including a large number of letters from interested parties, some advocating and some opposing the proposed improvement.

The reports of three previous preliminary examinations, to be found, respectively, on page 924, Annual Report Chief of Engineers for 1875; on page 1577, ibid., for 1889, and on page 1826, ibid., for 1895, contain information as to the physical characteristics of this stream and as to its obstructions. It appears that by the removal of rafts and snags, and by dredging, it would not be difficult to secure a 3-foot channel from the mouth of the river to Victoria (about 34 miles), and that it might be feasible to carry such a channel to Cuero, 26 miles farther up. The Guadalupe River empties into a shallow arm of San Antonio Bay. This bay has no direct connection with the Gulf. Between it and Espiritu Santo Bay, which connects with Matagorda Bay and thence through Pass Cavallo with the Gulf, there is a wide shoal pierced by a narrow channel of uncertain depth. A similar flat lies between San Antonio Bay and the adjacent arm of Aransas Bay. Unless a channel across one of these flats should be provided, traffic on the river could find outlet by rail alone. The San Antonio and Aransas Pass Railway crosses the river at Cuero, the New York, Texas and Mexican Railway at Victoria, and the Gulf, Western Texas and Pacific Railway connects these two places, paralleling the stream. The object of the improvement, so far as the people of Victoria are concerned, is to secure "water rates" to that place. It is evident that this can be accomplished only by extending the improvement to the Gulf, and it is doubtful whether a channel 3 feet deep would have any marked effect upon rates. In the absence of a connection with the Gulf, river traffic would be at the mercy of the railroads.

Approximate estimates of the cost of certain parts of the work are found in the report of the preliminary examination made in 1894. Thus, it is estimated that it would cost in the neighborhood of $42,000 to remove the rafts below Victoria and about $150,000 to provide a chan̄nel to Pass Cavallo. Mention is likewise made of the fact that the maintenance of a channel in Mission Bay would be expensive.

As appears from statements furnished by interested parties the proposal to improve the Guadalupe does not meet with unanimous favor in the locality. It is contended by some that if the river is cleared its low-water slope and level will be reduced and its capacity for irrigating rice fields diminished.

In view of all the facts the Board concurs with the district officer and the division engineer in the opinion that it is not desirable at the present time for the United States to undertake the improvement of the Guadalupe River.

For the Board:

H. F. Hodges,
Major, *Corps of Engineers*,
Senior Member Present.

U 14.

PRELIMINARY EXAMINATION OF CHANNEL BETWEEN MATAGORDA AND LAVACA BAYS, TEXAS.

[Printed in House Doc. No. 180, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith report, dated June 17, 1903, by Capt. C. S. Riché, Corps of Engineers, on preliminary examination of Matagorda Bay and Lavaca Bay, Texas, with a view to securing a channel 9 feet in depth and 100 feet in width between said bays. This examination was made in pursuance of a requirement in the river and harbor act of June 13, 1902, and, for reasons given, Captain Riché is of the opinion, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, that the locality is not worthy of improvement by the General Government in the manner proposed.

This report has been reviewed by the Board of Engineers for Rivers and Harbors under the provisions of sections 3 and 14 of the above-mentioned act, and the Board concludes, for reasons stated in its report of July 24, 1903, that it is not desirable for the United States at the present time to undertake this work.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. C. S. RICHÉ, CORPS OF ENGINEERS.

United States Engineer Office,
Galveston, Tex., June 17, 1903.

General: In compliance with circular letter dated Office Chief of Engineers, June 23, 1902, I have the honor to submit the following report of preliminary examination of a channel between Matagorda Bay and Lavaca Bay, as required by the following item of the river and harbor act approved June 13, 1902:

> Matagorda Bay and Lavaca Bay, with a view to securing a channel nine feet in depth and one hundred feet in width between said bays.

Matagorda and Lavaca bays are shown on United States Coast and Geodetic Survey chart No. 207. This chart shows that a channel 9 feet deep through Pass Cavallo connects the Gulf of Mexico with Matagorda Bay, though the depth of this channel is reported by local sailing masters to vary from time to time, occasionally being reduced to 7 feet; thence a depth of 10 to 11 feet is shown to the upper end of Matagorda Bay, shoaling to 8 feet for about 2 miles until Sand Point reef is reached, across which a channel 10 feet deep is shown; thence for about 3½ miles across lower Lavaca Bay a depth of 7½ feet is shown to Gallinipper reef, across which a channel 7 feet deep is shown, though it is claimed this channel has shoaled in recent years; thence across upper Lavaca Bay a depth of 7 to 8 feet is shown to within about one-fourth mile of Port Lavaca, shoaling to between 4 and 5 feet at the ends of the wharves at the latter town. All these depths are at mean low water. During northers it is claimed that the water is blown out of the bays, its surface falling below the level of mean low. At such times the above depths are correspondingly reduced.

Port Lavaca, which would receive the chief benefit from the proposed improvement, has a population of about 1,200. It has one railroad, the Gulf, Western Texas and Pacific, which is a branch of the Southern Pacific Railway system. Its chief industry is the shipping of fish and oysters, it being the chief shipping point for oysters on the Texas coast. There are good prospects that rice will become the leading agricultural product in the immediately surrounding country.

* * * * * * *

The work proposed, it is claimed by those interested, would enable freight from the counties of Calhoun, Victoria, Refugio, Jackson, and Matagorda to be shipped via schooner to Galveston and adjacent deep-water points at a much smaller rate than at present.

The present rate by rail on cotton from Port Lavaca to Galveston is 30 cents per hundred, or $1.50 per bale. By schooner the present rate is $1 per bale plus insurance. It is claimed that the proposed channel would result in cotton being taken from Port Lavaca to Galveston for 50 cents per bale; but I feel that such rate could not long be maintained, and that a rate of 75 cents per bale would be what would ultimately be charged.

The conditions governing schooner traffic between Lake Charles, La., and Galveston are very nearly similar to those that would govern such traffic between Port Lavaca and Galveston should the proposed improvement be made. I am imformed by Captain Bromwell that between the jetties and through the dredged channel at lower end of Calcasieu Lake there is 7½ feet of water at mean low tide; through Calcasieu Lake, on account of soft-mud bottom, there is practically 6 feet, and from Calcasieu Lake to Lake Charles, La., there is not less than 12 feet.

The Annual Report of the Chief of Engineers for 1902, page 1346, states that the draft of the heaviest vessel using the mouth and passes of Calcasieu River during the calendar year 1901 was: Light, 6.5 feet; loaded, 8 feet.

Local inquiries concerning the rates between Lake Charles and Galveston have developed the following:

Rates by rail.

Lumber, per hundred	$0.06
Cotton, per hundred	.30
First-class freight, per hundred	.30
Second-class freight, per hundred	.28
Third-class freight, per hundred	.20
Fourth-class freight, per hundred	.20

Rates by schooner.

Lumber, per M feet B. M.	$3.00
Cotton, per bale	.75
General merchandise, per hundred	.20

It seems, therefore, exceedingly doubtful if lower rates than the above would apply between Port Lavaca and Galveston should the proposed improvement be made.

These rates, however, would generally be less than those at present in force, and the total annual saving on the freight affected might be enough to warrant such an improvement were there no other circumstances to consider.

There is, however, an alternative proposition already before Congress which if adopted would, in my judgment, result in lower rates between Port Lavaca and Galveston than could be obtained should the improvement now under consideration be made.

This alternative proposition is that for a canal 6 feet deep and 60 feet wide from Donaldsonville, La., to the Rio Grande, and was originally reported on in 1875, copy of the report being printed on page 876 et seq., Part 1 of the Annual Report of the Chief of Engineers for 1875.

This report contemplates a sheltered waterway navigable in nearly all weathers by flat-bottomed steamboats and barges of much greater carrying capacity than coasting schooners adapted to 9-foot channels. Transportation costs by such a waterway could hardly exceed 2 mills per ton-mile, which, including insurance and contingencies, would give a rate between 35 and 50 cents per bale on cotton from Port Lavaca to Galveston, or from Lake Charles to Galveston.

In view of the great reduction in cost of dredging, this canal would cost far less to-day than was estimated in 1875. An improvement of this character would give Port Lavaca materially lower rates than the improvement now proposed. It would also give similarly low rates to all intermediate points, whereas the benefit of the improvement now proposed would be very largely concentrated at Port Lavaca alone.

Improvements for ocean traffic of less than 18 to 20 feet depth can hardly be consistently recommended when an alternative improvement of the above character is already under consideration. Existing rates from Lake Charles to Galveston when compared with probable rates via such a canal, and when it is also considered that $511,500 has already been appropriated for Calcasieu and $262,681 is yet needed there, makes a similar improvement for Port Lavaca, even at less cost, of doubtful advisability.

In view of all of the above, therefore, I feel compelled to report that in my opinion the channel between Matagorda Bay and Lavaca Bay is not at the present time worthy of improvement by the General Government in the manner proposed.

* * * * * * *

Very respectfully, your obedient servant,

C. S. Riché,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., June 20, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of the district engineer officer that the channel between Matagorda Bay and Lavaca Bay is not at the present time worthy of improvement by the General Government in the manner proposed.

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
June 24, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., July 24, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on the preliminary examination of "Matagorda Bay and Lavaca Bay [Texas], with a view to securing a channel 9 feet in depth and 100 feet in width between said bays," the indorsement of the division engineer thereon, and other data available.

The intent of the act must cover an investigation into the desirability of a channel from Port Lavaca Bay to the Gulf of Mexico, since a channel simply connecting the two bays would serve no purpose whatever. The distance from Port Lavaca to the Gulf is about 25 miles. The latest information as to depths in Pass Cavallo and these bays is shown on Coast Survey Chart No. 207, which, however, is not of recent date. It appears from this chart that dredging would be required throughout the upper 9 miles of the distance between Port Lavaca and the Gulf. The cost of obtaining the required channel would probably not fall short of $100,000. The cost of maintaining a channel excavated through flat sand bays, in water subject to tidal influence and to irregular oscillations due to wind, would be considerable. The channel at Pass Cavallo, in which a depth of 9 feet is shown on the map, is reputed to be variable in depth and position. It would be impracticable to estimate from existing data the cost of securing and maintaining a 9-foot entrance channel.

The provision of an improved channel from Port Lavaca to the Gulf would no doubt effect a reduction of freight rates between that point and Galveston, but of just how much is uncertain. Nine feet is not a sufficient draft to develop a large traffic to be carried on in vessels which must navigate outside waters in competition with existing transportation facilities in this locality.

The present and prospective commerce of Port Lavaca is small. The Board believes that the cost of the improvement specified in the act would be out of proportion to the resulting commercial benefits, and concurs in the opinion of the district officer and division engineer that it is not desirable for the United States at the present time to undertake the work of securing "a channel 9 feet in depth and 100 feet in width" between Matagorda and Lavaca bays.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

U 15.

PRELIMINARY EXAMINATION OF ST. CHARLES BAY, TEXAS.

[Printed in House Doc. No. 77, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith report, dated May 28, 1903, by Capt. C. S. Riché, Corps of Engineers, on preliminary examination of St. Charles Bay, Texas, with a view to the removal of reefs which now obstruct navigation, made pursuant to a requirement in the river and harbor act of June 13, 1902.

In the opinion of Captain Riché, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, and by the Board of Engineers for Rivers and Harbors, which has considered this report, in accordance with the provisions of sections 3 and 14 of the abovementioned act, the improvement of this locality is not worthy to be undertaken by the General Government. I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. C. S. RICHÉ, CORPS OF ENGINEERS.

United States Engineer Office,
Galveston, Tex., May 28, 1903.

General: In compliance with circular letter, dated Office Chief of Engineers, June 23, 1902, I have the honor to submit the following report of preliminary examination of St. Charles Bay, as required by the following item of the river and harbor act approved June 13, 1902:

> Saint Charles Bay, with a view to the removal of reefs which now obstruct navigation.

St. Charles Bay forms an arm of Aransas Bay. As shown by the Coast Survey chart, it is about 9 miles long and about a mile and a quarter wide. Its maximum depth at mean low tide is shown as 5 feet, but the prevailing depth along its center appears to be about 3½ feet. A reef across its outer end, however, shows a maximum depth of 1¼ feet. From off the entrance to St. Charles Bay between 5 and 6 feet of water can be carried to Rockport, Aransas Pass, and Corpus Christi.

Attention is invited to the inclosed letters[a] from Messrs. D. M. Picton and L. Cobolini regarding the improvement of the bay.

I believe the improvement of the bay, as outlined in the above-quoted item of the river and harbor act, would be premature and would not be of sufficient general benefit.

Under the circumstances, therefore, I feel constrained to report that, in my opinion, St. Charles Bay, Texas, is not worthy of improvement at the present time.

Very respectfully, your obedient servant,

C. S. Riché,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Gulf Division,
New Orleans, La., June 1, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of the district engineer officer that St. Charles Bay, Texas, is not worthy of improvement by the General Government at the present time.

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
June 6, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Third indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., July 29, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer on the preliminary examination of "Saint Charles Bay, with a view to the removal of reefs which now obstruct navigation," the indorsement of the division engineer thereon, and other data available.

St. Charles Bay is an arm of Aransas Bay. As shown by the Coast Survey chart, it is about 9 miles long and about 1¼ miles wide. Its maximum depth at mean low tide is shown as 5 feet, but the prevailing depth along its center appears to be about 3½ feet. A reef across its outer end, however, shows a maximum depth of 1¼ feet. From off the entrance to St. Charles Bay between 5 and 6 feet of water can be carried to Rockport, Aransas Pass, and Corpus Christi. The maximum depth that would serve any purpose at the entrance to this bay is 3½ to 4 feet. Such a channel would be 1½ or 2 miles long. At this outlying locality the cost of the work would be comparatively great. On account of physical conditions the same is true of its maintenance.

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[a] Not printed.

The adjacent country is thinly settled. Communications received from interested parties contain no definite information on the subject of present or prospective commerce; but it appears that the commerce of the bay is limited to the importing of domestic supplies and the exporting of fish. The provision of an entrance channel corresponding in depth with the depth in the bay would not develop a commerce commensurate with the probable cost of the work.

For these reasons the Board is of opinion that it is not desirable at the present time for the United States to undertake the improvement of St. Charles Bay.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

U 16.

REPORT OF A BOARD OF ENGINEERS UPON EXAMINATION OF SECTION ONE OF TRINITY RIVER, TEXAS, I. E., BETWEEN DALLAS AND THE EAST FORK, WITH A VIEW TO SECURING NOT LESS THAN EIGHT MONTHS' NAVIGATION ANNUALLY BETWEEN SAID POINTS.

[Printed in House Doc. No. 118, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 8, 1903.

Sir: I have the honor to submit herewith for transmission to Congress the report, dated November 22, 1903, of a Board of Engineers convened in accordance with the following provision of the river and harbor act approved June 13, 1902:

> Improving Trinity River, Texas, in accordance with the report submitted in House Document Numbered Four hundred and nine, Fifty-sixth Congress, first session, one hundred and twenty-five thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for materials and work to prosecute the project recommended in said report, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two hundred and seventy-five thousand dollars, exclusive of the amount herein appropriated: *Provided further*, That three hundred and fifty thousand dollars of the amounts herein appropriated and authorized shall be expended to construct locks and dams upon the river between the mouth and section one, in those places where the most serious obstructions exist, and to procure and operate snag boats, and clear the river with the purpose of permitting through navigation over the portion above described; and the sum of fifty thousand dollars of the amount herein appropriated shall be expended for the purpose of securing open-channel navigation in section one of said river, and a board of engineers shall be designated by the Secretary of War to examine section one of said river as described in said House document, and report upon the feasibility and advisability of expending the further sum of three hundred and fifty thousand dollars with a view to securing not less than eight months' navigation annually upon the said section one to Dallas.

The project, which this legislation adopts in part, contemplates a total expenditure of $4,650,000 on the river and considers the river as divided into four sections, the first of which extends from Dallas to the East Fork, and is 49 miles long. For this section, which is the highest one of the proposed improvements, five locks and dams are projected. The district officer's estimate of the cost of improving this section is $625,000. The question placed before the Board is the feasibility and advisability of expending the further sum of $350,000 on this section, in addition to the $50,000 appropriated by the act.

Pursuant to the provision quoted, a Board of Engineers, consisting of Lieut. Col. H. M. Adams, Maj. G. McC. Derby, and Capt. W. V. Judson, all of the Corps of Engineers, United States Army, was ordered and has considered the matter, collected data, and prepared estimates for the work. On October 31, 1902, it submitted a preliminary report,[a] and now submits its final report. From this it appears that the fall of water from Commerce street shoal at Dallas to the shoal about 1,000 feet below East Fork is 63.6 feet.

As a result of its examination, the Board thinks that 6 locks and dams will be required on the first section of the river instead of 5, since the banks of the river are low and exposed to danger of flooding should dams of high lift be used. The Board further considers that movable dams would be required, and recommends that the estimates for the locks shall contemplate the standard methods of lock construction. With locks 50 feet wide, having available lengths of 140 feet, the total improvement of this section would, according to the estimate of the Board, cost $918,000. The discharge of the river is such that a stage of 2.9 feet on the Dallas gauge is required to permit 10 lockages per day and keep the pools full. For 20 lockages the corresponding gauge reading is 3.2 feet. Assuming these conclusions to be correct, the record during the year ending October 17, 1903, showed 111 days when 10 lockages per day would not have been possible, and 133 days when 20 lockages would not have been possible. It is the opinion of the Board that were section 1 canalized, the discharge would be sufficient to permit navigation throughout periods of time aggregating from six to seven months annually, at an expenditure of $918,000. In years with favorable quantity and distribution of rainfall, eight months' navigation might be expected, but such favorable conditions would rarely obtain.

In view of the facts and opinions above stated, the Board concludes that it is not feasible to secure eight months' navigation annually upon section 1 of the Trinity River with an expenditure of the further sum of $350,000, and reports that in its opinion "it is an obvious consequence of the infeasibility of the work contemplated in the act that it is inadvisable."

One member of the Board, while concurring in the opinion that it is not feasible to secure eight months' navigation with the contemplated expenditure, and that it is consequently inadvisable to attempt it, does not subscribe to certain other views advanced by the Board as to the number of locks necessary and the amount of rainfall, and expresses the opinion that it is advisable to expend even a very much larger sum than $350,000 with a view to securing not less than eight months' navigation annually upon said section 1 of the Trinity River to Dallas, assuming that Congress has already decided to improve the lower part of the river.

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[a] Not printed.

It is my opinion that the majority of the Board acted wisely in adopting for purposes of estimate a height of dam which should secure the bottom lands against injury from the raised water level, and that it was not the province of the Board under the law to consider the advisability of accomplishing the result called for by an expenditure larger than that named in the act.

I concur in the conclusions of the majority of the Board, and do not regard it as feasible or advisable to spend the further sum of $350,000 on section 1 of the Trinity River, as contemplated in the act.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF BOARD OF ENGINEERS.

New Orleans, La., *November 22, 1903.*

General: The Board of Engineers, constituted under the provisions of the act of June 13, 1902, to examine section 1 of the Trinity River improvement, and "report upon the feasibility and advisability of expending the further sum of three hundred and fifty thousand dollars with a view to securing not less than eight months' navigation annually upon the said section one to Dallas," has the honor to submit its final report.

Attention is invited to a preliminary report submitted under date of October 31, 1902, wherein the Board requested that certain data should be obtained and certain plans and estimates made under the direction of the district officer to enable the Board to pass upon the subject intelligently. It has necessarily required about one year to secure the data, plans, and estimates.

Pursuant to the call of the senior member, the Board resumed its sessions in Galveston, Tex., on November 19, 1903. Remaining in session for two days, the Board listened to further arguments from interested citizens of Dallas, studied the records for the past year of several gauges, the results of numerous discharge observations, plans and estimates for various types of locks and dams, and all other data available pertaining to the canalization of the Trinity River for a distance of 49 miles below Dallas, Tex., or to East Fork, this section of river being that described in the act as section 1. A part of these data[a] and a number of plans[a] are herewith submitted as inclosures.

On November 20, 1903, the Board adjourned to meet in New Orleans on November 22, 1903. At its session in New Orleans, the Board finished its discussions and signed this report.

The fall at low water from Commerce street shoal at Dallas to the shoal, about 1,000 feet below East Fork, is 63.6 feet. The banks are comparatively low, and to overcome the fall it now appears necessary to use 6 locks and dams, each of comparatively low lift, rather than a lesser number of high-lift structures, lest the lowlands be unduly flooded. It is the opinion of the Board that movable dams will be required, and that estimates for the locks should contemplate the employment of standard methods of lock construction. Based upon locks 50 feet wide with available lengths of 140 feet, such as would be suitable for the navigation contemplated, the following estimate of cost of improving section 1 is submitted:

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[a] Not printed.

Lock and Dam—	Below Dallas.	Lift.	Cost.
	Miles.	*Feet.*	
No. 1	13	11½	$140,000
No. 2	22	6¾	138,000
No. 3	26	6¾	135,000
No. 4	30	6¾	135,000
No. 5	34¼	9	135,000
No. 6	[a]42½	12½	145,000

[a] The lower 6½ miles of section 1 will fall in the pool of the upper dam projected for section 2.

Total for locks and dams	$828,000
For dams across Parsons Slough and Old River	75,000
For cleaning Parsons Slough and for dredging	15,000
Total for improvement	918,000

Each item above embraces an allowance of about 20 per cent for administration and contingencies.

While the Board believes that this estimate is the least one that is safe, it recognizes the possibility of reducing the cost of work somewhat from the figures stated by the employment of concrete-steel construction.

With regard to water supply, it may be said that the past year has been exceptional as regards precipitation upon the watershed of section 1. At Dallas the rainfall was 47.32 inches for the year beginning November 1, 1902, as compared with an average for the last fourteen years of 33.69 inches.

Observations during the past year indicate the following relation between discharges and gauge readings (Dallas gauge):

Gauge reading.	Discharge per second.
Feet.	*Cubic feet.*
2 (low water)	10 (low water)
2.5	26.1
2.9	55
3	63
3.2	75
3.5	91
4	126
4.5	168
5	237

Assuming the total amount of water required for leakage, evaporation, and 10 lockages per day at 53.6 cubic feet per second, it is seen from table in preceding paragraph that a stage of at least 2.9 feet on the Dallas gauge is required to maintain pool heights. Under the more liberal assumption that leakage, evaporation, and 20 lockages per day would require 74.9 cubic feet per second, the corresponding gauge reading is 3.2 feet.

The following table shows the number of days in each month of the year ending October 17, 1903, upon which the Dallas gauge readings exceeded or fell below 2.9 feet and 3.2 feet, respectively:

Month.	Days at 2.9 or above.	Days below 2.9.	Days at 3.2 or above.	Days below 3.2.
1902.				
October 18–31	2	12	2	12
November	27	3	27	3
December	28	3	27	4
1903.				
January	18	13	17	14
February	28	0	28	0
March	31	0	31	0
April	27	3	23	7
May	7	24	5	26
June	26	4	21	9
July	29	2	25	6
August	14	17	9	22
September	0	30	0	30
October 1–17	17	0	17	0
Total	254	111	232	133

It is the opinion of the Board that, were section 1 canalized, the discharge would be sufficient to permit navigation throughout periods of time aggregating from six to seven months annually. In years with favorable quantity and distribution of rainfall, eight months' navigation might be expected; but such favorable conditions would rarely obtain.

In view of the facts and opinions above stated, the Board is forced to the conclusion that it is not feasible to secure eight months' navigation annually upon section 1 of the Trinity River with an expenditure of the further sum of $350,000. As the Board understands the language of the act directing its report, it is an obvious consequence of the infeasibility of the work contemplated in the act that it is inadvisable.

Respectfully submitted.

H. M. Adams,
Lieut. Col., Corps of Engineers.
W. V. Judson,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

MINORITY REPORT OF THE BOARD.

I concur in the opinion that it is not feasible to secure eight months' navigation annually upon section 1 of the Trinity River with an expenditure of $350,000, and that it is consequently inadvisable to attempt it. I can not, however, subscribe to the other views advanced by the Board, because I believe that it is neither necessary nor advisable to change the original project for the work by increasing the number of locks and dams from five to six; the latest project, as submitted to the Board, has not yet received the action of the district officer, and when it has I believe he will be able to materially reduce the estimate submitted by the Board. The rainfall of the year 1903 is not, in my judgment, exceptionally favorable to the feasibility of the project because, while the total rainfall for the year is greatly in excess of the average, the rainfall for the driest six months of the year is only 11.15 inches, while the average is 13.67 inches. I therefore do not think that the favorable conditions referred to by the Board would only rarely obtain. Finally, as it is abundantly shown (inclosures 23[a] and 27[a]) that a water route to Dallas would save the people of the community at least $1,500,000 per annum in freights on cotton alone, I am of the opinion that it is advisable to expend even a very much larger sum than $350,000 with a view to securing not less than eight months' navigation annually upon said section 1 of the Trinity River to Dallas, assuming that Congress has already decided to improve the lower part of the river.

Respectfully submitted.

G. McC. Derby,
Major, Corps of Engineers.

U 17.

MODIFICATION OF HARBOR LINES IN GALVESTON BAY AT TEXAS CITY, TEXAS.

The Texas City Company,
Duluth, Minn., May 30, 1903.

Sir: Texas City Company, a corporation organized under the laws of the State of Texas, is the owner of the lands at the shore end of the channel now excavating from Galveston Harbor to Texas City, as well as the lands for some distance on each side of this shore end. The company desires to at once make certain improvements on the water front in the matter of docks and approaches, but the present harbor line is inconveniently near the shore.

We ask that the harbor (dock) line be changed to a line parallel with and 400 feet farther into the bay than the present harbor line. If any map or other information should accompany this request, or it should be in any other form, whatever is necessary in that respect will be done promptly on receipt of a suggestion as to what is required.

Respectfully,

Texas City Company,
By T. J. Davis, *President.*

The Secretary of War.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
June 3, 1903.

Respectfully referred to Capt. C. S. Riché, Corps of Engineers, for report.

If Captain Riché should be of opinion that a change in the harbor line is permissible, he will please submit a tracing showing such modification as may be recommended.

To be returned.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

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[a] Not printed.

[Seventh indorsement.]

U. S. ENGINEER OFFICE,
Galveston, Tex., May 4, 1904.

Respectfully returned to the Chief of Engineers, United States Army, with inclosed map[a] and field notes as per memorandum inclosed with sixth indorsement, October 9, 1903.

After being duly advertised, riparian proprietors and all interested parties, had a public hearing March 28, 1904, at which a similar map * * * was exhibited with tentative lines marked thereon.

After those interested had expressed their views, the lines as shown were agreed upon, and are recommended for adoption.

EDGAR JADWIN,
Captain, Corps of Engineers.

[Eighth indorsement.]

WAR DEPARTEENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, May 10, 1904.

Respectfully returned to the Secretary of War.

For the reasons given the Texas City Company requests a modification of the established harbor line on Galveston Bay at Texas City, Tex.

The papers were referred to the local engineer officer and there appearing to be no serious objection to the desired change, tentative lines were drawn and submitted for inspection at a public meeting, to which all parties interested were given an invitation by public advertisement to be present.

The modified line considered and agreed upon at such public hearing is indicated on the accompanying tracing.[a]

Concurring in the opinion that the line now proposed may be adopted without serious detriment to navigation interests, I recommend that the desired modification be approved by the Secretary of War, and that the Secretary place his approval on the tracing which has been prepared for his signature.

A. MACKENZIE,
Brig. Gen., Chief of Engineers, U. S. Army.

NOTE.—The lines referred to and shown on the map mentioned were approved by the Assistant Secretary of War May 10, 1904, the approval being indicated on the map.

DESCRIPTION.

Beginning at point G, from which New Shoal Point beacon bears S. 37° 20′ W. 2,260 feet; thence southeasterly 4,120 feet to a point on the axis of Fourth avenue north, Texas City, produced, and 2,160 feet easterly from its intersection with Bay street; thence south-southwesterly 3,010 feet to a point E on the north boundary line of the Sylvester Bowen survey produced into Galveston Bay 1,250 feet from its intersection with the axis of Bay street; thence southerly and parallel with Bay street 2,760 feet to a point D on the south limit of the Texas City Company's property produced easterly into Galveston Bay and 1,250 feet from its intersection with the axis of Bay street produced; thence S. 3° 22′ E. 3,020 feet to a point C; thence south 19,100 feet to a point B; thence southwesterly 3,650 feet to a point A on the Galveston, Houston and Northern Railway bridge (wrecked) over West Galveston Bay. The point A is 2,400 feet easterly from milepost 46 of the Galveston, Houston and Northern railway, measured along the axis of track and trestle.

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[a] Not printed.

APPENDIX V.

IMPROVEMENT OF CERTAIN RIVERS AND WATERWAYS IN LOUISIANA, TEXAS, ARKANSAS, INDIAN TERRITORY, AND MISSISSIPPI, TRIBUTARY TO MISSISSIPPI RIVER.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, CAPT. CHAS. S. BROMWELL, CORPS OF ENGINEERS, AND LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS.

IMPROVEMENTS.

1. Red River, Louisiana, Arkansas, Texas, and Indian Territory.
2. Cypress Bayou, Texas, and Louisiana.
3. Ouachita and Black rivers, Arkansas and Louisiana.
4. Bayou Bartholomew, Boeuf River, Tensas River, and Bayou Maçon, and bayous D'Arbonne and Corney, Louisiana and Arkansas.
5. Mouth of Yazoo River and Harbor at Vicksburg, Mississippi.
6. Yazoo, Tallahatchie, and Big Sunflower rivers, and Tchula Lake, Mississippi.

EXAMINATIONS.

7. Big Black River, Mississippi.
8. Cypress Bayou, Texas.
9. Red River from Fulton, Arkansas, to Denison, Texas.
10. Sulphur River, Texas.
11. Tallahatchie River, Mississippi.
12. Yalobusha River, Mississippi.

United States Engineer Office,
Vicksburg, Miss., July 20, 1904.

General: I have the honor to send herewith annual reports for the fiscal year ending June 30, 1904, upon the works of river and harbor improvement of the Vicksburg, Miss., district.

This district was in the charge of Capt. Chas. S. Bromwell, Corps of Engineers, until May 26, 1904, and temporarily in my charge after that date.

Very respectfully, your obedient servant,

H. M. Adams,
Lieut. Col., Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

V 1.

IMPROVEMENT OF RED RIVER, LOUISIANA, ARKANSAS, TEXAS, AND INDIAN TERRITORY.

GENERAL IMPROVEMENT.

The U. S. snag boat *C. W. Howell* was employed almost continuously during the year, and its operations extended over the river between Colfax, La., and Fulton, Ark., 364 miles, and above Fulton about 23 miles to the Kansas City Southern Railway bridge. The boat was in command of Watkins Decker, master, until January 25, 1904, when he was transferred to the snag boat *O. G. Wagner* in Ouachita River, and was succeeded by Robert Elflein, the present master of the *Howell.*

The following is a summary of the work performed:

Snags pulled and destroyed	1,818
Stumps pulled, cut, and destroyed	268
Shore snags cut	1,058
Jams broken up and destroyed	3
Side jams broken up and destroyed	8
Logs removed from channel	175
Logs cut up along banks	4
Leaning trees felled and destroyed	2,430
Trees girdled	49
Mud lumps in channel destroyed	2
Bowlders (at Grand Ecore, La.) destroyed	4
Wreck removed	1

Steamboat *Carrie S.* sunk 1872, at Pecan Point, La.

During a high stage in June, 1904, the *Howell* was sent to New Orleans, La., to be docked, to have the steel hull scraped and repainted, and to undergo other essential repairs. The boat arrived at New Orleans June 17, and the repairs were in progress at close of the year.

The U. S. snag boat *O. G. Wagner*, Robert Elflein, master, was transferred from Ouachita River to lower Red River October 1, 1903; was employed until January 13, 1904, between the Atchafalaya River and O. K. Landing, La., 179 miles above, and removed the following obstructions to navigation:

Snags pulled and destroyed	886
Stumps pulled, cut, and destroyed	3,092
Shore snags cut	1,109
Side jams broken up and destroyed	2
Logs cut up along banks	374
Leaning trees felled and destroyed	589
Cubic yards of earth removed with explosives	425

The Bucyrus elevator dredge at Shreveport, La., purchased in 1895, was sold September 2, 1903, to Mr. J. S. Codifer, of New Orleans, La., for $5,001, and the funds were deposited to the credit of the appropriation. The sale was made under authority of the Chief of Engineers to the highest bidder after thirty days' advertisement.

ABOVE FULTON, ARK.

The snag boat *Howell* removed 41 snags from the channel above Fulton May 13 to 16, 1904, which are included in the summary of work performed by that boat, reported above.

A quarter boat was built and fitted out at Shreveport, La., for the use of a party to be employed at low stages in the river above Shreveport to mouth of the Kiamichi River, Indian Territory, clearing caving and sliding banks and removing jams of drift and channel obstructions as far as possible. May 6 to 12, 1904, this boat was towed by the snag boat *Howell* from Shreveport upstream 248 miles to Lewis Ferry, Tex., about 60 miles above Fulton, Ark. A party under Overseer J. B. Cason, equipped with tools, explosives, etc., was organized at Lewis Ferry, Tex., commenced work May 24, and continued until June 3. On that date the river began rising and continued to rise so rapidly that snagging was discontinued. The quarter boat was cordeled upstream, and on June 30 had reached McCowen, Tex., 103 miles above Fulton.

The following obstructions to navigation were removed by this party, viz:

Channel snags cut and destroyed	79
Shore snags cut and destroyed	686
Leaning trees felled and cut up	874
Trees girdled	69
Square yards of willows and brush cut	220
Wrack heap destroyed	1

AT SHREVEPORT, LA.

An inspection of this locality was made by Captain Bromwell July 8, 1903, who found that the effect of the floods of December, 1902, and March, 1903, and of subsequent high stages of the river had been to scour and temporarily restore the navigable channel to the desired location through the drawspan of the bridge. The disturbances of regimen, caused by a number of cut-offs which made during the floods, and by subsequent caving of the banks as the water receded, were still in progress and were so great that it was impracticable to resume work under the project of September 25, 1902 (see Report for 1903, p. 1364), and the terms of the contract of November 13, 1902, with Hunter & Frey. A supplemental agreement therefore was made with Hunter & Frey September 10, approved by the Chief of Engineers October 6, and by the Acting Secretary of War October 10, 1903, terminating their contract for dike construction, and paying them $4,503.63 as full compensation for all work performed.

Mr. L. L. Griffith, junior engineer, made a reconnaissance in September, 1903, and reported that the bar had formed again under the drawspan of the bridge, and that where the last survey (May, 1903) showed a depth of 20 feet below zero it was entirely dry at zero of the gauge. He attributed the rapid change to a moderately high stage in July (15 feet), which, having been unaccompanied by any outflow from Cross Bayou, permitted the current to remain on the Shreveport side and caused the channel on the left side, under the draw, to fill. A resurvey of the locality was made in October, and November 21 a modified project for dike construction was submitted and was approved November 27, 1903.

This project proposed to repair and extend shoreward an old dike rebuilt by the United States in July and August, 1897 (see Report of 1898, p. 1576), and to build two new dikes immediately above it. The new dikes were to be constructed of a single row of round piles extending from top of the steep bank about 300 feet into the river, and the old dike was to be connected with the bank in the same way. The interstices between piles were to be closed with smaller round piles, hand driven, and the heads of all secured by a line of waling pieces, front and back, tightly drawn together by bolts through or between the pile heads. The tops of the dikes were to be between 7 and 8 feet above zero of the gauge from outer end to near low-water edge, and then rise to top of bank. The work was to be performed by hired labor at an estimated cost of about $5,000.

A pile-driver frame was erected on the bow of the snag boat *Howell*, and April 4 to 13, 1904, the crew of that vessel was employed in constructing the shore ends of the three dikes. Piles were driven at edge of the steep bank and outward as far as the stages would permit. Forty-five piles were driven in the extension of the old dike, and 32 piles were driven in each of the two new dikes. The stages of April, May, and June were not favorable for completing the dikes.

From 1895 to 1902 there were no very high stages of Red River and the work of snag boats, repeated from year to year during that period, had resulted in a well-defined steamboat channel, reasonably free of obstructions. In December, 1902, there was a disastrous flood culminating at Shreveport, La., December 16, at 34.1 feet on the gauge (1.6 feet below the extreme high water of 1892). This was followed by a second flood which reached a height of 33.1 feet on the Shreveport gauge March 22, 1903. During these floods seven cut-offs made, the levee breached at one place above Shreveport; the channel of the river shifted, building up bars and uncovering snags and wrecks, immense quantities of trees and stumps were thrown into the river by the rapidly caving banks, and much of the work of seven years was undone in a few months.

During the past year snagging operations extended over the river from the Atchafalaya River, Louisiana, to Fulton, Ark., and as far above Fulton as practicable, with a view to opening up the channel as quickly as possible. With the available funds it is proposed to continue this work and to complete the dike construction for improvement of the channel at Shreveport, La. If necessities arise for additional work in accordance with the existing project, supplementary plans and recommendations will be submitted.

The improvement of Red River since October 10, 1903, was carried on under the local supervision of Mr. H. M. Marshall, assistant engineer, whose report is appended. Mr. John Ewens, the former assistant engineer, after a protracted illness, died February 20, 1904. Mr. Marshall was aided by Mr. L. L. Griffith, junior engineer, stationed at Shreveport, La., until March 31, 1904, when he was succeeded by Mr. W. H. Polk, assistant engineer at that place.

The amounts expended during the year and the unexpended balances July 1, 1904, were as follows:

Allotments.	Expended during year.	Balance unexpended July 1, 1904.
General improvement	$30,990.10	$67,770.98
Above Fulton, Ark	1,151.09	4,501.91
At Shreveport, La	5,215.86	15,340.18
Total	37,357.05	87,613.07

The expenditures are classified as follows:

GENERAL IMPROVEMENT.

Snag boat *C. W. Howell:*		
Pay roll	$12,492.09	
Fuel	1,762.38	
Subsistence supplies	2,188.59	
Rope, chain, tools, oil, explosives, equipment, etc	2,093.56	
Repairs	859.86	
		$19,396.48
Snag boat *O. G. Wagner:*		
Pay roll	3,122.41	
Fuel	416.18	
Subsistence supplies	489.96	
Rope, chain, tools, oil, explosives, equipment, etc	891.48	
Repairs	139.58	
Traveling expenses, master and pilot	18.27	
		5,077.88
Quarter boat *No. 5:*		
Construction	1,818.62	
Outfit	403.15	
Tools, etc	139.36	
		2,361.13
Engineering, administration, etc.:		
Pay of assistants, etc	1,861.83	
Traveling expenses of assistants and mileage of district officer	118.91	
Pay of office employees	1,723.67	
Office rent, stationery, telegrams, repairs of instruments, etc	450.20	
		4,154.61
Total		30,990.10

ABOVE FULTON, ARK.

Snag boat *C. W. Howell:*		
Pay roll	$345.00	
Fuel	165.00	
Subsistence supplies	24.33	
Telegrams	.59	
		$534.92
Quarter boat *No. 5:*		
Pay roll	168.67	
Subsistence supplies	133.60	
Explosives, etc	313.50	
Telegrams	.40	
		616.17
Total		1,151.09

AT SHREVEPORT, LA.

Amount paid contractors upon termination of contract	$4,503.63
Percentage reserved from prior payment	43.01
Dike construction under modified project:	
Labor	299.32
Hire of hoisting engine	99.00
Material, etc	265.90
Traveling expenses	5.00
	5,215.86

Money statement.

July 1, 1903, balance unexpended		$119,969.12
Amount received from sale of dredge and equipment		5,001.00
		124,970.12
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$5,215.86	
For maintenance of improvement	32,141.19	
		37,357.05
July 1, 1904, balance unexpended		87,613.07
July 1, 1904, outstanding liabilities		3,296.29
July 1, 1904, balance available		84,316.78
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904		[a]75,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

The appropriations for the early work, from 1828 to 1852, were as follows:

May 23, 1828	$25,000.00	March 3, 1841	$75,000.00
March 2, 1831	187.50	March 2, 1847	7,150.00
July 3, 1832	22,628.00	August 30, 1852	100,000.00
June 28, 1834	50,000.00		
March 3, 1835	50,000.00	Total	535,765.50
July 2, 1836	40,800.00 30,000.00	Amount expended	532,219.90
March 3, 1837	65,000.00	Amount carried to surplus fund	3,545.60
April 20, 1838	70,000.00		

The appropriations since 1872 have been as follows:

June 10, 1872	$20,000 150,000	July 5, 1884	$75,000
March 3, 1873	80,000	August 5, 1886	75,000 7,000
June 23, 1874	50,000	August 11, 1888	65,000 35,000 3,000
March 3, 1875	20,000	September 19, 1890	100,000 28,000 2,000
August 14, 1876	35,000	July 13, 1892	145,000 3,500
April 10, 1869 [b]	4,500	August 18, 1894	150,000 3,500
February 7, 1878	6,000	June 3, 1896	100,000 3,000
June 18, 1878	24,000 25,000	March 3, 1889	150,000
March 3, 1879	15,000 22,500 10,000	June 13, 1902	135,000
June 14, 1880	25,000 60,000 10,000		
March 3, 1881	10,000 10,000		
August 2, 1882	75,000	Total	1,732,000

COMMERCIAL STATISTICS.

Navigation of Red River above the Atchafalaya River, Louisana, to Fulton, Ark., was not suspended during the year, except by the bar at Shreveport, La.; but during lowest water in December, the larger boats could not run.

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[a] Biennial appropriation should be $150,000.
[b] Allotment made August 27, 1877, for closing Tones Bayou.

List of steamboats in the Red River trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Electra	Stern-wheel.	272	170.0	35.0	5.2	2.3	7.1	New Orleans and Shreveport, La.	16	179
W. T. Scovell	do	154	160.0	31.0	3.7	1.5	4.0	do	7	27
Red River	do	97	155.0	28.0	3.5	1.6	5.0	do	15	68
F. Weyerhauser[a]	do	216	140.0	31.0	4.5	2.5	4.0	Baton Rouge and local points.	8	....
H. C. Brockman[a]	do	75	91.0	22.6	3.8	2.0	3.0	do	8	....
Lillie[a]	do	61	120.0	26.0	3.5	2.0	4.0	do	....	....
May Fisher[a]	do	52	92.0	18.8	4.0	2.0	2.0	do	....	....
Anna Tardy	do	71	81.2	18.0	4.0	2.0	3.0	Shreveport and local points.	50	....
Geo. L. Bass	do	53	91.0	21.0	3.3	1.5	3.5	Boyce and local points	21	....
Advance[a][b]	do	17	69.3	11.2	2.9	2.0	3.0	Alexandria and Garland.	23	....
Mary B.[a]	do	84	96.9	20.8	3.3	......	......	New Orleans and local points.	....	....
Laurel	Tug	67	65.7	16.8	7.0	......	......	Baton Rouge and local points.	....	....
Will H. Wood	do	44	72.2	16.6	7.6	......	......	do	....	....
Alfred Hennen[b]	do	31	70.0	15.0	3.0	......	......	New Orleans and mouth Black River.	1	....
Flora	do	35	69.0	14.4	7.6	......	9.0	Bayou Sara and local points.	....	....
Capt. Pabst	Gasoline.	12	......	......	......	1.0	2.0	Shreveport and local points.	25	....
Blue Eagle	do	14	40.0	12.0	......	1.3	2.5	Fulton and local points.	....	500
Annie P	......	55	......	......	......	1.0	2.5	Shreveport and Garland.	7	....
King Bee[a]	......	8	......	......	......	4.0	5.0	Lake Long and Simmesport, La.	32	....
Frank R. Hill	......	......	140.0	30.0	......	......	......	Fulton, Ark. (building).	....	....
Belle Prince	Stern-wheel.	68	114.4	19.6	3.6	......	......	Not reported	....	....
Kingfisher	do	27	74.6	16.1	2.5	1.7	2.1	do	....	....

[a] Towboat.

[b] With one or more barges.

Summary of commerce reported.

Articles.	1903–4.	Articles.	1903–4.
	Tons.		*Tons.*
Cotton	3,377	Provisions	225
Cotton seed	5,212	Grain	104
Live stock	3	Fish	64
Lumber	250	Miscellaneous	26,343
Saw logs	243,768		
Staves	600	Total	279,946

Estimated value, $2,165,840.

A large part of the commerce of Ouachita and Black rivers passes up and down Lower Red River. During the fiscal year 1903–4 this aggregated 180,923 tons, valued at $7,311,540, and the business of the past fifteen years ranges between 73,679 and 313,863 tons per annum, with values estimated at $3,293,000 to $10,234,250, the average of the fifteen years being 177,174 tons, valued at $6,404,120.

REPORT OF MR. H. M. MARSHALL, ASSISTANT ENGINEER.

United States Engineer Office,
Vicksburg, Miss., June 30, 1904.

Colonel: I have the honor to submit a report of operations on Red River, Louisiana, Arkansas, Texas, and Indian Territory, during the fiscal year ending June 30, 1904.

GENERAL IMPROVEMENT.

July 1, 1903, the U. S. snag boat *C. W. Howell*, Watkins Decker, master, was working upstream from St. Maurice, La. After working as high as Grand Ecore the boat turned back and went down to Colfax. Very little was done below Montgomery, but from there up work was carried on continuously to Coushatta till the middle of October, when, during a small rise in the river, the boat ran to Shreveport for minor repairs to machinery. Much trouble was experienced all the season by the breaking of the capstans in pulling over bars. After a few days' delay the boat went down the river to Grand Ecore and worked up to the vicinity of Tones Bayou, and then ran to Shreveport, arriving there January 23, 1904. Watkins Decker, master of the *Howell*, exchanged places with Robert Elflein, master U. S. snag boat *O. G. Wagner*, on January 25, 1904. During a small rise the boat went above Shreveport, but on account of a quick fall turned back, going as far down as East Point, and working upstream to Shreveport. Throughout March, April, May, and early part of June work was carried on above Shreveport, back and forth as high as Fulton, Ark., according to the stage of river. Also within this period, April 4 to 14, the *Howell* was used as a pile-driver boat building dikes in Shreveport Harbor, and May 6 to 12 towed a quarter boat for a chopping party from Shreveport to Lewis Ferry, Tex., about 65 miles above Fulton, Ark. While above Fulton the *Howell* removed 41 snags from the channel. June 4, 1904, the gauge at Shreveport read 3.3 feet, and there was only 2 feet depth of water under the draw span of the Vicksburg, Shreveport and Pacific Railway bridge. As there was plenty of water under the fixed spans, the chimneys of the *Howell* were lowered and she passed under the bridge. The boat worked down the river, but was overtaken at St. Maurice by a heavy swell on June 14 that put an end to her work, which had been almost without cessation for the whole year.

The *Howell* was sent to New Orleans, arriving there June 17, 1904, to be docked at the McLelland dock and have the outside of the hull scraped and painted. She will be painted and have some repairs made which will require about three weeks.

The U. S. snag boat *O. G. Wagner*, Robert Elflein, master, entered Red River at the mouth of Black River October 1, 1903, and left by the same route January 13, 1904. In the interim she worked as high as O. K. Landing, 179 miles above the Atchafalaya, and down to Sugar House Chute. The river was put in good condition.

During the year a quarter boat, with hull 68 feet 3 inches long, 18 feet wide, 3 feet 6 inches deep, was built and outfitted at Shreveport. As stated above, it was towed by the snag boat *Howell* to Lewis Ferry, Tex., where work began removing obstructions from the river by means of saws, axes, and explosives. Operations were carried on upstream by a crew of 14 men under Overseer J. B. Cason. Shortly after work began a big rise set in and work was interfered with. The party cordeled the boat up the river endeavoring to reach the mouth of Kiamichi, 170 miles above Fulton, Ark. At the end of the year they were at McCowen, Tex., 67 miles below Kiamichi.

The range between high and low water at the several stations on Red River during the fiscal year was as follows:

Gauge station.	Low water.		High water.		Range.
	Date.	Reading.	Date.	Reading.	
		Feet.		*Feet.*	*Feet.*
Arthur City, Tex.[a]	Jan. 18–22, 1904 Mar. 12–17, 1904	4.00	July 6, 1903	26.50	22.50
Fulton, Ark.[b]	Dec. 16, 17, 1903	5.30	June 14, 1904	31.60	26.30
Shreveport, La.[b]	Nov. 29, 1903 Dec. 2–12, 16–19, 21–23, 1903	−2.00	June 23–25, 1904	28.50	30.50
Alexandria, La.[b]	Dec. 10–12, 1903	−1.00	June 30, 1904	29.50	30.50

[a] Weather Bureau gauge. [b] Mississippi River Commission gauge.

AT SHREVEPORT, LA.

After a personal examination of the river at Shreveport the district officer determined it to be not advisable to carry out the existing project under contract with Messrs. Hunter & Frey. With the approval of the Chief of Engineers the contract was terminated, and September 10, 1903, the contractors were paid $4,503.63 in full settlement for the work they had done.

October 19 to 30, 1903, a survey was made and the soundings compared with those of May, 1903. It showed the channel under the draw span of the Vicksburg, Shreveport and Pacific Railway bridge was filling and the thread of the river moving to the Shreveport side. A modified project for three dikes was submitted November 21 and approved November 27, 1903. This contemplated using the old wing dam built in 1897, repairing and extending it, both into the river and to the shore, where it had been flanked. In addition two dikes, each about 300 feet in length, were to be built at about equal intervals between the old dike and Cross Bayou, the dikes to be constructed of round piles driven in line as closely together as possible, with smaller piles, driven by hand, to close the openings between; a line of heavy waling to be bolted along both sides of the piles near the top so as to draw the heads together; the dikes to begin well back on the top of the bar and the heads of the piles to step down the slope to near the low-water line, and from there out to stand about 7 feet above zero of the gauge. April 4 to 13, 1904, a pile-driver frame was erected on the deck of the U. S. snag boat *C. W. Howell* and the shore ends of the dikes were built as far as the stage of water would permit. Thirty-two piles were driven in dikes 1 and 2 each and 45 piles in No. 3. High stage of river has prevented further work, but arrangements have been made for hire of a pile-driver barge and outfit, and as soon as the water falls the work will be resumed.

Until April 1, 1904, Junior Engineer L. L. Griffith was in local charge at Shreveport, when he was relieved by Assistant Engineer W. H. Polk.

Within the last fifteen years the changes which have taken place in Red River below the hills near the Louisiana-Arkansas State line down to the hills at Grand Ecore have been quite remarkable. Where formerly the river was narrow and tortuous, with low banks lined with timber, now is a wide open channel with long bends, large sand bars, high banks, and cleared fields. Of course it is all due to clearing of the country, confinement of the waters by levees, cut-offs, and removal of sunken logs from the river bed. It is the first step toward regulating and improving the river. At times of medium and high stages the river is easily navigated, and injuries or accidents to boats are few. But at low water the navigation is little better than it was before the improvement began. Though boats are no longer menaced by snags and there is ample depth in the long pools, yet the river has spread out over the bars in a thin sheet or is divided into several channels, so that navigation is hindered or stopped. Movements of the snag boat are greatly hampered at times of very low water when snags are most easily found, and there is not time enough at a somewhat higher working stage to get over the river. Several days, sometimes a week, may be spent dragging a snag boat drawing 3 to 4 feet over a bar on which there is less than 2 feet of water, only to get into a pool that can be cleared of snags in a day; or worse still, to be met by a sudden rise which puts an end to all work for the time being. After pulling over a bar the depth on it is no greater, and it is no easier to get over than it was before. It is safe to say that not over half of the time of the snag boat is spent removing obstructions. By exercising great watchfulness, combined with a good deal of luck, the boat can be worked up the river to meet a rise and back down with a fall so as to keep fairly well occupied and accomplish considerable benefit at not too great cost. But as stated, the inability to get about when most could be accomplished greatly circumscribes her usefulness. The removal of the timber from the banks has lessened the number of snags to be removed by the snag boat, but it has also cut off the boat's fuel supply. Now, coal brought in on the railroads along the banks is the only source of fuel between Alexandria and Shreveport. From two days to a week are lost each month waiting for fuel and getting it on board. These conditions have made snag work less important, less beneficial, and more costly than formerly, and suggest the use of other means to properly control and direct the low-water channel and flow.

Very respectfully, your obedient servant,

H. M. Marshall,
Assistant Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

V 2.

IMPROVEMENT OF CYPRESS BAYOU, TEXAS AND LOUISIANA.

No work was done during the year beyond that required for care of the United States dredge at Shreveport, La., which was sold under authority of the Chief of Engineers in September, 1903.

The expenditure of the available funds for dredging, or for the removal of stumps, etc., will afford no improvement of navigation between Shreveport and Jefferson, and it is recommended that the project be repealed and that the money be paid into the Treasury. The stream is not worthy of further improvement by the United States.

Money statement.

July 1, 1903, balance unexpended	$3,566.16
June 30, 1904, amount expended during fiscal year	363.50
July 1, 1904, balance unexpended	3,202.66

The appropriations for Cypress Bayou and the lakes have been as follows:

By act of—	
June 10, 1872	$10,000.00
March 3, 1873	50,000.00
August 14, 1876	13,000.00
June 18, 1878	15,000.00
March 3, 1879	6,000.00
August 5, 1886	18,000.00
August 11, 1888 (allotted from appropriation for Red River)	5,000.00
September 19, 1890 (for survey)	10,000.00
July 13, 1892 (for survey)	2,000.00
July 13, 1892 (allotted from appropriation for Red River)	1,701.33
August 18, 1894	10,000.00
June 3, 1896	5,000.00
Total	145,701.33

COMMERCIAL STATISTICS.

Cypress Bayou between Jefferson and the lakes was reported navigable all the year for light-draft boats. Only in the latter part of June could a boat ascend from Shreveport, La.

List of boats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft. Light.	Draft. Loaded.	Between—	Round trips.	Passengers.
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Anna Tardy	Sternwheel	71	81.2	18	4	2	3	Shreveport, La., and Jefferson, Tex.	½	7
Nellie G	Gasoline	15	......	......	......	1.5	......	Jefferson, Tex., and the lakes.	100	....

Summary of commerce reported.

Articles.	1903–4.
	Tons.
Saw logs	120
Telephone poles	1,725
Miscellaneous	4
Total	1,849

Estimated value, $9,100.

V 3.

IMPROVEMENT OF OUACHITA AND BLACK RIVERS, ARKANSAS AND LOUISIANA.

GENERAL IMPROVEMENT.

Work for the maintenance and general improvement of navigation was continued by the U. S. snag boat *O. G. Wagner* from July 1 to September 30, 1903, and from January 13 until February 26, 1904, when the boat was laid up with the plant at Monroe, La. Operations extended from the mouth of Black River, Louisiana, to Buffalo Flats, Arkansas, 328.7 miles above, and put the river in good navigable condition for the time. The *Wagner* was commanded by Robert Elflein, master, until January 25, 1904, when he was transferred to the snag boat *Howell* in Red River and relieved by Watkins Decker.

The following is a summary of the work performed by the *Wagner*, viz:

Snags pulled and destroyed	886
Stumps pulled, cut, and destroyed	876
Shore snags cut	587
Leaning trees felled	1,377
Logs cut up	333
Wrecks removed (boilers, etc., of steamer *Pearl Davis*, sunk 1 mile above Ouachita Belle Landing, Ark., and sunken coal flat at Trisler Landing, La.)	2

After suspending work the proper care was taken of plant laid up at Monroe, La.

COMPLETION OF SURVEY FOR LOCKS AND DAMS.

Survey work in the field consisted of borings and local surveys at the sites of Locks and Dams Nos. 4 and 6. Office work upon the maps and notes was continued during the year.

LOCKS AND DAMS NOS. 4 AND 6.

Bids for building the two locks and dams were invited by advertisement for one month—December 22, 1903, to January 22, 1904—and but two bids were received, the lowest aggregating as follows:

For building Lock and Dam No. 4	$232,588.08
For building Lock and Dam No. 6	272,806.20
Total	505,394.28

This amount being largely in excess of the estimates and of the expenditure authorized by Congress, the bids were rejected.

After some minor changes of plan with a view to decreasing the cost, the work was readvertised for six weeks—March 3 to April 15, 1904—and but one bid was received, as follows:

For building Lock and Dam No. 4	$291,980.66
For building Lock and Dam No. 6	334,129.50
Total	626,110.16

This bid was rejected.

June 18, 1904, the work was advertised the third time, and proposals are to be received until August 17, 1904.

The work was under the local supervision of Mr. H. M. Marshall, assistant engineer, whose report is appended hereto.

ESTIMATES.

The amounts expended during the year and the unexpended balances June 30, 1904, were as follows:

	Expended during year.	Balance June 30, 1904.
For maintenance of improvement	$7,570.60	$4,538.76
For completion of survey	2,864.63	2,158.35
For Locks and Dams Nos. 4 and 6	7,649.67	311,979.99
Total	18,084.90	318,677.10

These balances will be applied to the purposes stated.

The additional appropriation recommended is for the following work:

Completing Locks and Dams Nos. 4 and 6, being balance of amount pledged by river and harbor act approved June 13, 1902	$103,954
Rebuilding snag boat *O. G. Wagner*	50,000
Maintenance of improvement for one year by snagging work	20,000
Maintenance of improvement at Catahoula shoals by dredging	10,000
Total	183,954

Money statement.

July 1, 1903, balance unexpended		$336,762.00
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$7,649.67	
For completion of survey	2,864.63	
For maintenance of improvement	7,570.60	
		18,084.90
July 1, 1904, balance unexpended		318,677.10
July 1, 1904, outstanding liabilities		48.46
July 1, 1904, balance available		318,628.64
Amount (estimated) required for completion of existing project		1,668,576.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$103,954.00	
For rebuilding snag boat *Wagner*	50,000.00	
For maintenance of improvement	[a]30,000.00	
		183,954.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

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[a] Biennial appropriation should be $50,000.

The appropriations have been as follows:

By act of—		By act of—	
March 3, 1871	$25,000	August 5, 1886	$17,500
March 3, 1871	26,000	August 11, 1888	20,000
June 10, 1872	60,000	September 19, 1890	15,000
June 10, 1872	40,000	July 13, 1892	40,000
March 3, 1873	60,000	August 18, 1894	50,000
August 14, 1876	12,000	June 3, 1896	70,000
June 18, 1878	10,000	March 3, 1899	110,000
March 3, 1879	10,000	June 13, 1902	31,500
June 14, 1880	8,000	June 13, 1902	80,000
March 3, 1881	12,000	March 3, 1903	250,000
August 2, 1882	12,000		
July 5, 1884	15,000	Total	974,000

COMMERCIAL STATISTICS.

During the fiscal year 1904 Ouachita and Black rivers were reported navigable for New Orleans packets to Camden, Ark., from February 1 to June 30. At lowest stages New Orleans boats could not ascend above Harrisonburg, La. Small, light-draft boats could run all the year except eight weeks.

List of steamboats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
America	Stern wheel.	427	200.0	38.0	6.5	4.0	11.3	New Orleans and Monroe, La.	3	375
City of Camden	do	299	175.0	35.0	5.0	2.5	5.5	New Orleans and Camden, Ark.	42	1,932
Bob Blanks	do	265				3.0	7.0	New Orleans and Monroe.	18	1,600
H. M. Carter	do	97	156.0	28.0	6.0	1.6	5.0	do	35	1,132
Roberta	do	94				2.5	6.0	Monroe and local points.	12	220
Handy	do	49				2.0	4.5	do	15	308
John B. Robinson	do	43	90.0	18.0	3.5	1.3	3.0	Monroe and Ouachita city.	4	
F. Weyerhauser[a]	do	216	140.0	31.0	4.5	3.0	4.5	Through Black River		
Alarm[a] [b]	do	189	142.0	26.0	4.3	3.4	4.4	Not reported	1	
Will Davis[a] [b]	do	150	100.8	23.6	3.6	1.7	2.2	do		
Lillie[a] [b]	do	61	120.0	26.0	3.5	2.0	4.0	do		
Dixie[a] [b]	do	71	119.1	20.6	3.6	1.2	7.5	New Orleans and Alabama Landing.	1	
May Fisher[a] [b]	do	52	92.0	18.8	4.0	2.0	2.0	New Orleans and local points.		
Ruby[a]	do	49	77.0	16.1				Not reported		
Laurel	Tug	67	65.7	16.8	7.0			do		
Will H. Wood	do	44	72.2	16.6	7.6			do		
Union[b]	Gasoline.	14	70.0	12.0		1.3	2.3	Monroe and local points.		
Skipper	Yacht	3				2.5	3.5	Not reported		
W. A. Brown	Derrick boat.	40				2.0	4.0	do		
Columbia	Stern wheel.	139				2.0	5.0	New Orleans and Camden.	20	490

[a] Towboat.

[b] With one or more barges.

Summary of commerce reported.

Articles.	1903–4.	Articles.	1903–4.
	Tons.		*Tons.*
Cotton	11,947	Brick	573
Cotton seed	5,825	Provisions	8,632
Hides and skins	23	Grain	7,736
Live stock	210	Miscellaneous	7,605
Lumber	4,579		
Saw logs	97,527	Total	180,923
Staves	36,266		

Estimated value, $7,311,540.

REPORT OF MR. H. M. MARSHALL, ASSISTANT ENGINEER.

United States Engineer Office,
Vicksburg, Miss., June 30, 1904.

Colonel: I have the honor to submit the following report on improvement of Ouachita and Black rivers, Arkansas and Louisiana, for the fiscal year ending June 30, 1904:

MAINTENANCE.

The U. S. snag boat *O. G. Wagner*, Robert Elflein, master, was finishing patrol above Monroe at the beginning of the year. During July work was carried on above Monroe as high as Mallard shoal, 231.7 miles above the mouth, and during August and September, except about a week spent in Tensas River, work was continued below Monroe to the mouth of Black River. The *Wagner* was employed on Red River from October 1, 1903, to January 13, 1904. On her return to the Ouachita she worked up to Buffalo flats, 328.7 miles above the mouth, by the 14th of February, where she turned back on account of low water. After reaching lock site No. 6 on her way down, she was employed there the rest of the month sinking a boiler shell to serve as a test pit to examine the foundation for the lock and dam. A sudden rise in the river put an end to all work, the boat ran down to Monroe, and was laid up there March 4, 1904.

On January 25, 1904, Watkins Decker, master U. S. snag boat *C. W. Howell*, was transferred to the *Wagner*, and Robert Elflein, master U. S. snag boat *O. G. Wagner*, to the *Howell*. On May 1, 1904, Watkins Decker was furloughed for one year on account of ill health.

The bad condition of the *Wagner* has been reported annually for several years. During the last season, besides the increased leaking in the hull two very serious weaknesses developed—one a crack in the boiler and the other the breaking down of the hoisting boom. Both defects were patched, but the boat is not safe to work on. She should be condemned as worthless and sold. In this connection it is suggested that the U. S. snag boat *C. W. Howell*, now on Red River, could be used to advantage on the Ouachita, especially after the locks and dams shall have been finished.

Snag work must be kept up as long as timber is left growing along the banks and "slides" occur, but the building of the locks and dams, causing pools, will lessen caving.

Gauges were read at Camden, Ark., Riverton and Black River Station, La., during the year. The highest and lowest stages reached were as follows:

Station.	Highest reading.		Lowest reading.	
	Date.	Feet.	Date.	Feet.
Camden, Ark	June 12, 1904	35.20	Dec. 9–14, 1903	3.60
Riverton, La	Apr. 21–22, 1904	36.65	Nov. 29–Dec. 2, 1903	1.87
Black River Station, La	May 7, 1904	41.63	Dec. 19, 1903	4.82

Gauge zero above Gulf level: Camden, 71.17 feet; Riverton, 15 feet; Black River Station, 4.57 feet.

SURVEY.

All indexes and tabulations of the notes and survey data were finished. These comprise 72 record books, which were labeled and filed. Recorder C. L. Coleman was furloughed March 11, 1904. Replotting the map sheets, scale 1:10,000, on heavy drawing paper, was continued. All the main line was finished in pencil, making 47 sheets. Of these, 41 sheets have the topography plotted on them and 31 are inked in, except titles and scales. Mr. John Hilleke is engaged drafting them.

LOCKS AND DAMS.

Plans and specifications for Locks and Dams Nos. 4 and 6 were finished in August, but were subsequently modified according to orders from the office of the Chief of Engineers. Bids for construction were advertised twice, and opened the following dates: First on January 22, when two bids for each lock and dam were received, and again April 15, when only one bid for each lock and dam was received. Of the first bids, one for Lock 4 was less than the total appropriation for that lock, but left not enough funds for engineering and administration. Besides, when taken with the other lower bid for Lock 6, the cost would have been over $71,000 above the amount authorized for the two locks and dams.

Further borings were made at both lock sites; at No. 4, 4 borings aggregating 125 feet; at No. 6, 22 borings amounting to 619 feet. Also, at lock site No. 6 the shell of a boiler was sunk in the bed of the river to a depth below the bottom of the proposed foundation of the dam wall. At both sites results of previous borings were confirmed as to impervious strata in which to drive the sheet piling, but at both places strata of very fine sand, of the nature of quicksand, occur about where it was proposed to locate the bottom of the dam walls. At a higher elevation the material is better, and it was decided best to not carry the wall so deep. Plans have been modified accordingly, and bids advertised to be opened August 17, 1904.

The 45 sheets of drawings which constitute a part of the specifications for the two locks and dams were finished, but the changes in plans necessitated alterations on 20 of the sheets. In fact some of them need making over. The difficulty has been gotten around by indicating changes in words written on the face of the blueprints, with such changes as were possible on the originals, and no delay has obtained on that account.

While laid up, the plant has been cared for at Monroe, La., and minor repairs have been made as needed.

On May 23, 1904, furlough was granted Junior Engineer Wm. R. Neely at his own request, to enable him to accept a position on work connected with the United States Military Academy, at West Point, N. Y. He leaves behind a most excellent record after thirteen years of nearly continuous service. He has been on Ouachita River work since survey began in 1895.

Very respectfully, your obedient servant,

H. M. Marshall,
Assistant Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

V 4.

IMPROVEMENT OF BAYOU BARTHOLOMEW, BOEUF RIVER, TENSAS RIVER, AND BAYOU MAÇON, AND BAYOUS D'ARBONNE AND CORNEY, LOUISIANA.

These tributaries of Ouachita River are not navigable at low water. The plan in process of execution is for maintenance of their improvement by removing snags, logs, wrecks, leaning timber, etc., to afford reasonably safe navigation at medium and high stages. Drift, caving and sliding banks, and the rapid growth of vegetation constantly add obstructions, which accumulate rapidly and become more difficult to remove each year they are permitted to remain.

The localities are as follows:

(*a*) Bayou Bartholomew from mouth to McComb Landing, Ark., 141 miles; estimated annual cost of maintenance, $2,500.

(*b*) Boeuf River from mouth to Wallace Landing, La., about 170 miles; estimated annual cost of maintenance, $2,500.

(*c*) Tensas River from mouth to Westwood Place, La., 81 miles, and Bayou Maçon, a tributary of Tensas River, from its mouth to Floyd, La., 112 miles; estimated annual cost of maintenance, $2,500.

(*d*) Bayou D'Arbonne from mouth to Bayou Corney and up that stream to Cobb Landing, La., 57 miles; estimated annual cost of maintenance, $1,000.

Operations during the fiscal year ending June 30, 1904, were as follows:

(A) BAYOU BARTHOLOMEW.

In January, 1904, the quarter boat was towed from Jonesville, La., at the mouth of Tensas River, up Ouachita River to Bayou Bartholomew, and 5 miles up the bayou to Potts Landing. A small party was employed in Lower Bayou Bartholomew below Point Pleasant, La., from January 26 to February 5, removing trees, etc., that had caved and slid into the stream. Upon completion of this work the quarter boat was towed to Monroe, La., and laid up with the fleet at that place. The latter part of June the boat was moved back to Point Pleasant, and June 25 to 30 work was carried upstream to Gordon Bluff, La., 36.8 miles above the mouth.

The following is a summary of the work performed:

Channel snags cut and destroyed	99
Shore snags cut and destroyed	21
Logs cut and destroyed	55
Stumps cut and destroyed	23
Trees felled and destroyed	66
Square yards of willows and brush cut	1,120

Money statement.

July 1, 1903, balance unexpended	$2,320.65
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	970.14
July 1, 1904, balance unexpended	1,350.51
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	[a]2,500.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

(B) BOEUF RIVER.

July 1 to 8 the party organized for this work in June, 1903, under Overseer J. R. Vaughan (see Report of the Chief of Engineers, 1903, p. 1380), continued operations above the Vicksburg, Shreveport and Pacific Railway bridge near Girard, La., to the New Orleans and Northwestern Railway bridge north of Rayville, La. At the low stage it was impracticable to move the quarter boat farther upstream, and July 9 to September 14, 1903, work was carried down to the mouth of the river.

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[a] Biennial appropriation should be $5,000.

The following is a summary of the work performed July 1 to September 14, viz:

Channel snags cut and destroyed	1,015
Stumps cut and destroyed	421
Shore snags cut and destroyed	194
Logs removed from channel	2,210
Logs cut up and destroyed	2,964
Side jams broken up and destroyed	7
Trees felled and destroyed	409
Trees removed from channel	108
Square yards of willows and brush cut	7,864
Piles cut (under Vicksburg, Shreveport and Pacific Railway bridge)	35
Wrecks removed (sunken stave barges)	2

Money statement.

July 1, 1903, balance unexpended	$11,007.48
Amount transferred to allotment for Tensas River and Bayou Maçon	1,500.00
	9,507.48
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	3,383.11
July 1, 1904, balance unexpended	6,124.37
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	[a]2,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

(c) TENSAS RIVER AND BAYOU MAÇON.

The U. S. snag boat *O. G. Wagner*, Robert Elflein, master, entered Tensas River September 1 and ran upstream to the New Orleans and Northwestern Railway bridge at Clayton, where it was employed in removing sunken logs from the channel until September 5. By that time the water had receded until it was too low for the snag boat to continue work at the locality, and it proceeded downstream to the mouth, removing all obstructions in sight.

The following obstructions to navigation were removed by the *Wagner* September 1 to 8, viz:

Snags pulled	20
Logs removed from channel	152

After suspension of work in Boeuf River the *Wagner* ran to the mouth of that stream, and September 15 and 16 towed the quarter boat to and up Tensas River about 14 miles above the mouth, but was unable to proceed farther on the low stage. September 17 to 30 the force upon the quarter boat cordelled it upstream 141 miles to Floyd, on Bayou Maçon.

Operations for the improvement of Bayou Maçon were commenced at Floyd, La., October 1, and were carried down to Tensas River November 20. The quarter boat was then moved up Tensas River to Westwood Place and worked back to Ouachita River December 19, 1903.

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[a] Biennial appropriation should be $5,000.

The following is a summary of the work performed in Bayou Maçon and Tensas River October 1 to December 19, viz:

Channel snags cut and destroyed	1,276
Stumps cut and destroyed	488
Shore snags cut and destroyed	336
Logs removed from channel	729
Logs cut up and destroyed	1,532
Jam broken up and destroyed	1
Trees felled and destroyed	565
Trees removed from channel	21
Square yards of willows and brush cut	21,553
Cubic yards of earth removed from channel with explosives	47

Money statement.

July 1, 1903, balance unexpended	$2,698.67
Amount allotted by transfer from Boeuf River	1,500.00
	4,198.67
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	3,075.60
July 1, 1904, balance unexpended	1,123.07
July 1, 1904, outstanding liabilities	14.00
July 1, 1904, balance available	1,109.07
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	[a]2,500.00

(D) BAYOUS D'ARBONNE AND CORNEY.

Work in these streams was not resumed during the year.

Money statement.

July 1, 1903, balance unexpended	$563.58
July 1, 1904, balance unexpended	563.58
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	[a]1,000.00

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[a] Biennial appropriation should be $2,000.

The appropriations for the improvement of these streams have been as follows:

By act of—	Bayou Bartholomew.	Boeuf River.	Tensas River and Bayou Maçon.	Bayous D'Arbonne and Corney.	Total.
March 3, 1881	$8,000.00	$5,000.00	$3,000.00	....	$16,000.00
August 2, 1882	5,000.00	5,000.00	....	....	10,000.00
July 5, 1884	5,000.00	5,000.00	4,000.00	$5,000.00	19,000.00
August 5, 1886	5,000.00	5,000.00	4,000.00	2,000.00	16,000.00
August 11, 1888	5,000.00	6,000.00	5,000.00	2,000.00	18,000.00
September 19, 1890	5,000.00	5,000.00	5,000.00	2,000.00	17,000.00
July 13, 1892	5,000.00	10,000.00	5,000.00	4,000.00	24,000.00
August 18, 1894	5,000.00	8,000.00	5,000.00	[a]2,000.00	20,000.00
June 3, 1896	4,000.00	6,000.00	5,000.00	....	15,000.00
March 3, 1899	5,000.00	6,000.00	4,000.00	....	15,000.00
June 13, 1902 (allotments)	5,000.00	3,500.00	4,000.00	2,500.00	15,000.00
Total amount appropriated	57,000.00	64,500.00	44,000.00	19,500.00	185,000.00
Total amount expended	55,649.49	58,375.63	42,876.93	18,936.42	175,838.47
Balance unexpended	1,350.51	6,124.37	1,123.07	563.58	9,161.53

[a] Act of August 18, 1894, also appropriated $1,000 for Little D'Arbonne.

October 23, 1903, the Acting Secretary of War authorized an allotment of $1,500 for continuing the improvement of Tensas River and Bayou Maçon, by transfer from the unexpended balance for Boeuf River. This transfer causes the above statement of appropriations to differ from that published in the last report. (Report Chief of Engineers, 1903, p. 1381.)

It is proposed to apply the available balances and the additional appropriations recommended to a continuance of the work for maintenance of navigation, in accordance with the plan set forth in the first paragraph of this report.

The work was carried on under the local supervision of Mr. H. M. Marshall, assistant engineer, whose report is appended hereto.

COMMERCIAL STATISTICS.

BAYOU BARTHOLOMEW.

During the fiscal year 1904 Bayou Bartholomew was reported navigable from February to June, inclusive.

List of boats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Handy	Stern-wheel	49	......	......	......	2.0	4.5	Monroe and Lind Grove	8	20
Union[a]	Gasoline	14	70	12	......	1.3	2.3	Monroe and local points	......	....

[a] With one barge.

Summary of commerce reported.

Articles.	1903–4.
	Tons.
Cotton	101
Cotton seed	1,160
Lumber	38
Miscellaneous	1,490
Total	2,789

Estimated value, $285,000.

BOEUF RIVER.

During the fiscal year 1904 Boeuf River was reported navigable from March to May, inclusive.

Lists of boats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Roberta	Stern-wheel	96.0	......	......	......	2.5	6.0	Monroe and local points.	5	40
Lillie[a] [b]	do	61.0	120	26	3.5	2.0	4.0	Not reported	.....	....
Lee Otis[b]	Tug	4.5	40	9	5.0	4.5	4.5	do	.....	....

[a] Towboat.

[b] With one or more barges.

Summary of commerce reported.

Articles.	1903–4.
	Tons.
Cotton	9
Cotton seed	800
Miscellaneous	2,330
Total	3,139

Estimated value, $64,000.

TENSAS RIVER AND BAYOU MAÇON.

During the fiscal year 1904 Tensas River and Bayou Maçon were reported navigable from February to June, inclusive.

List of boats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
J. W. Swayze	Stern-wheel	86	110.0	21.0	3.7	2.0	4.0	Jonesville and local points.	40	175
T. K. Green	do	32	81.8	17.3	3.1	2.0	3.5	Trinity and Kirk Ferry.	30	100
Bettie Lee[a]	do	28	56.0	12.0	2.5	1.0	2.5	Crockets Point and Floyd.	22	....

[a] With one or more barges.

Summary of commerce reported.

Articles.	1903–4.
	Tons.
Cotton	1,509
Cotton seed	1,656
Lumber	1,040
Miscellaneous	5,230
Total	9,435

Estimated value, $354,000.

BAYOUS D'ARBONNE AND CORNEY.

During the fiscal year 1904 Bayous D'Arbonne and Corney were reported navigable from February to June, inclusive.

List of boats engaged in the trade during the fiscal year.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Handy	Stern-wheel	49	......	......	......	2.0	4.5	Monroe and Farmerville.	11	80
L. B. Carter[a]	Gasoline	8	54	10	......	1.0	2.0	.....do	36	3
Palmer	.....do	14	61	14	2.5	1.3	2.5	Monroe and Beach Bluff.	30	....
Will Wall[a]	.....do	12	......	......	......	1.3	2.3	.....do	19	....
Ada B	.....do	....	40	8	......	1.0	2.0	Monroe aud mouth of Choudrant.	10	....
Union[a]	.....do	14	70	12	......	1.3	2.5	Monroe and local points.	.....	....
Warren	.....do	5	40	8	......	1.0	2.0	.....do	.....	....
Oceola	.....do	24	70	15	2.5	1.3	2.5	Not reported	.....	....

[a] With one or more barges.

Summary of commerce reported.

Articles.	1903–4.
	Tons.
Cotton	348
Cotton seed	748
Lumber	30
Miscellaneous	9,655
Total	10,781

Estimated value, $317,000.

REPORT OF MR. H. M. MARSHALL, ASSISTANT ENGINEER.

United States Engineer Office,
Vicksburg, Miss., June 30, 1904.

Colonel: I have the honor to report on the improvement of Bayou Bartholomew, Boeuf River, Tensas River, and Bayou Maçon, and bayous D'Arbonne and Corney, Louisiana and Arkansas, for the fiscal year ending June 30, 1904.

BAYOU BARTHOLOMEW.

It was not expected that any work would be done in Bayou Bartholomew till the present summer, as a thorough clearing out had been given in the autumn and early winter of 1902, but quite a number of trees caved in from the banks, almost blocking navigation. A small chopping party on the quarter boat, under Mr. J. R. Vaughan, overseer, was towed by the U. S. launch *Ouachita*, to Potts Landing, arriving there January 26, 1904. Work continued till February 5, and was carried as high as Point Pleasant, 28.7 miles above the mouth. All trees causing serious obstruction were removed.

June 21 to 24, 1904, the quarter boat was towed by the launch *Ouachita* from Monroe to Fuellan Ford and cordeled from there up to Point Pleasant. To the end of the month work was carried on upstream as far as Gordon Bluff, 36.8 miles above the mouth.

BOEUF RIVER.

At the beginning of the fiscal year the chopping party under Mr. J. R. Vaughan, overseer, was at the Vicksburg, Shreveport and Pacific Railway bridge near Girard, 121.7 miles above the mouth. It was intended to move the boat upstream to Point Jefferson, 150.8 miles above the mouth, but the low stage of water made it impracticable to go above the bridge of the New Orleans and Northwestern Railway north of Rayville, La. No boats have been above this bridge for several years and the river there was reported to be in good condition, hence no interests suffered.

Work was carried on downstream and finished at the mouth September 14, 1903.

TENSAS RIVER AND BAYOU MAÇON.

After work was finished on Boeuf, the party was transferred to Tensas and Maçon The U. S. snag boat *O. G. Wagner* towed the quarter boat from the mouth of Boeu to Westwood Landing, 13.5 miles above the mouth of Tensas, arriving there on the 15th of September. The water was too low for the snag boat to go higher, and the quarter boat was cordeled to Floyd, the head of navigation on Bayou Maçon, which is 111.6 miles from the mouth of Maçon. Work was carried downstream to the mouth of Bayou Maçon between October 1 and November 20. The boat was then cordeled up Tensas to Big Bayou, 64 miles above the mouth, where it arrived November 30. About 8 miles of river were cleared of obstructions going up, in order to facilitate moving the boat, and the rest was worked over downstream to the mouth by December 19.

The U. S. snag boat *O. G. Wagner*, Robert Elflein, master, worked in Tensas River September 1 to 8, inclusive, removing sunken logs near the sawmill at Clayton, and snags between there and the mouth.

No work was done during the fiscal year in bayous D'Arbonne and Corney, as they were cleaned out last year.

Parties interested in commerce on the tributaries of Ouachita have reported them in excellent condition and have highly commended the work done by the chopping party.

The work on these streams is directed toward rendering navigation more safe, as the widths and depths are ample when they are navigable at all.

Work in all these tributaries should be carried on under one project, the streams to be considered as one so far as work and money appropriated are concerned. The same general interests are involved, and frequently the same boats are employed on the several streams. The same work is to be done on each by the same party.

Together they afford 598 miles of navigable rivers, and $10,000 annual appropriation is not more than is needed for maintaining them in proper condition. Had it not been for a balance of nearly $10,000 brought over from an unused appropriation for Boeuf River, the last appropriation of $15,000 would have fallen short of maintaining these streams for two years.

Very respectfully, your obedient servant,

H. M. Marshall,
Assistant Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

V 5.

IMPROVEMENT OF MOUTH OF YAZOO RIVER AND HARBOR AT VICKSBURG, MISSISSIPPI.

The Atlantic, Gulf and Pacific Company, contractors for excavating the diversion route from Old River to Kleinston Landing, completed work September 5, 1903. The quantity of earth removed under this contract, from November 19, 1900, to September 5, 1903, was 5,836,366 cubic yards, which, at the contract price of 12.4 cents per cubic yard, cost $723,709.39. Payments made to the contractors during the year were for 85,610 cubic yards, $10,615.64, and for retained percentages amounting to $682.

Bids for the construction of a levee from a point on the accretion below the foot of De Soto Island, near mouth of Vicksburg Harbor, westward up the left bank of Mississippi River, and across the West Pass of Lake Centennial to high ground near King Point, in accordance with the plan recommended by a Board of Engineers and approved by the Chief of Engineers August 2, 1902 (see Report Chief of Engineers, 1903, pp. 1386, 1387), were invited by newspaper advertisement June 29 and opened July 15, 1903. Only one bid was received—that of Helgason Brothers & Garbish—who proposed to build section 1, at the west end, for 29½ cents per cubic yard, and section 4, at the east end, for 36½ cents per cubic yard. No bid was made for the intermediate sections. This bid was rejected by authority of the Chief of Engineers.

July 20, 1903, Helgason Brothers & Garbish made a modified proposal to build section 1 at 25 cents per cubic yard, section 2 at 31½ cents per cubic yard, section 4 at 32½ cents per cubic yard, and to hire to the United States teams and scrapers, etc., sufficient to build section 3 at the following rates: Teams, including tools and drivers, 50 cents per hour each; foremen at 30 cents per hour each, and laborers at 15 cents per hour each. Section 2 and the part of section 4, from station 78 to station 88, were to be completed by December 15, 1903, and the remainder of section 4 and all of section 1 were to be completed by December 1, 1904.

This bid was accepted. Formal contract was entered into August 5 and was approved by the Chief of Engineers August 12, 1903.

The contractors commenced work August 8 and completed sections 2, 3, and the part of 4 from station 78 to station 88 December 9, 1903, when operations upon the embankment were suspended until after the flood season had passed. On account of a protracted drought, conditions were not favorable for sodding the levee at any time after work commenced, and the contractors were released from the requirement to sod section 2 and the completed part of section 4 by a supplemental contract authorizing deductions of $2.50 for each station of 100 feet, to cover the probable expense of sodding. These sections and section 3 (built by hire of teams, etc.) were sodded in March, 1904, at the above rate of $2.50 per station.

The contractors resumed work at the west end of the levee May 30, 1904, and operations at section 1 were in progress at close of the year.

About 73 per cent of the levee is built, its condition being as follows:

Section 1, at west end, 15,563 cubic yards built. Contract price, 25 cents per cubic yard. Cost, $3,890.75. About 84,580 cubic yards to be built. Approximate cost, $21,145.

Section 2: Completed, 109,107 cubic yards. Contract price, 31½ cents per cubic yard. Cost, $34,368.71.

Section 3: Completed, 112,365 cubic yards. (Work performed by hire of teams, scrapers, etc.) Cost, $38,103.20. Average price, 33.9+ cents per cubic yard.

Section 4: Stations 78 to 88 completed, 71,869 cubic yards. Contract price, 32½ cents per cubic yard. Cost, $23,357.42. Stations 88 to 93 not commenced. Approximate contents, 28,619± cubic yards. Contract price, 32½ cents per cubic yard. Approximate cost, $9,301.18.

During progress of this work of levee construction it developed that, for engineering reasons, it would be desirable to omit construction of five stations (0 to 5) at the upstream end of section 1 and to build the lower end of section 4 to a new location at station 93. By authority of the Secretary of War, the contract of August 5, 1903, was modified June 28, 1904, to cover these changes of plan; reducing the quantity of embankment about 28,169 cubic yards. As the two ends of the levee were considered the most profitable parts of the original contract, provision was made for paying to the contractors the sum of $4,500, upon completion of the modified contract, to compensate them for losses under the changes of plan.

The work of protecting the ends of the levee was performed by hired labor, and was commenced November 10 and completed December 31, 1903. The east end was protected by a mattress and dike and the west end by a curved bulkhead and foot mat. The cost of the protection was $5,837.24.

Bids for the purchase of rock for protecting the ends and spur of the levee were opened September 15, 1903, and, under authority of the Chief of Engineers, an emergency contract was made September 26 with Oscar F. Barrett, of Cincinnati, Ohio, for delivering same on decked barges at mouth of the canal. This contract was completed May 28, 1904; 6,751.4 tons of riprap and 520 tons of spalls having been delivered at the price of $2 per ton, amounting to $13,502.80. The rock was unloaded by hired labor at a cost of $1,229.71.

It was found to be essential to protect from wave wash the portions of the levee not naturally protected by a growth of timber opposite the long sweep of open water of Lake Centennial on the north side and the Mississippi River on the south. After considerable study, the most economical method appeared to be by building a series of timber bulkheads, stepping up the slopes from base to crown, at intervals of 12 feet, the intervening spaces to be terraced by excavating in front of the bulkheads and filling behind them. After adopting this plan efforts were made to let the work by contract, without success in securing a reasonable bid from a reliable bidder, and it was performed by hired labor, commenced October 21, 1903, and completed February 20, 1904. The work consists of 29,544 linear feet of low bulkheads, having an exposed face of 3 feet, and 7,692 feet of high bulkheads along the crest of the levee, with an exposed face of 6 feet. The cost of construction, including materials and the terracing, was $17,702.58.

The latter part of February young willows were planted in the borrow pits adjacent to the berme of the levee at all places where it is not screened by a timber growth. In all 14,330 trees were planted, at an average cost of about 1 cent each.

Under authority of the Secretary of War, and with an opinion of the Attorney-General that the United States would acquire a valid title, settlement was made October 31, 1903, of a judgment of the United States circuit court for the southern district of Mississippi, taken January 12, 1903, awarding damages amounting to $2,850 for certain land in Warren County, Miss., condemned for levee purposes. Under similar authority a payment of $100 was made June 22, 1904. There are unpaid judgments of the court amounting to $175, and there is an additional case to be tried for acquiring title to 9.53 acres used in building the levee. No official information has been received of any action taken for condemning the part of the levee right of way situated in Louisiana. (See Report Chief of Engineers, 1903, p. 1387.)

Money statement.

July 1, 1903, balance unexpended	$241,548.29
June 30, 1904, amount expended during fiscal year, for works of improvement	164,902.23
July 1, 1904, balance unexpended	76,646.06
July 1, 1904, outstanding liabilities	1,722.22
July 1, 1904, balance available	74,923.84
July 1, 1904, amount covered by uncompleted contracts	34,946.18

LIST OF APPROPRIATIONS—EXISTING PROJECT.

July 13, 1892	$75,000
August 18, 1894	225,000
August 18, 1894	40,000
June 4, 1897	350,000
March 3, 1901	510,000
Total	1,200,000

ABSTRACT OF CONTRACT IN FORCE.

Name of contractor: Helgason Bros. & Garbish.
Nature of contract: Completing West Pass levee.
Rate per cubic yard: Section 1, 25 cents; section 4, 32½ cents.
Date of approval: August 12, 1903.
Date of beginning work: August 8, 1903.
Date of expiration: December 1, 1904.

COMMERCIAL STATISTICS.

For commercial statistics see Yazoo River and its tributaries.

REPORT OF MR. T. C. THOMAS, ASSISTANT ENGINEER.

United States Engineer Office,
Vicksburg, Miss., June 30, 1904.

Colonel: I have the honor to submit the following report on improvement of the mouth of Yazoo River during the fiscal year ending June 30 1904:

DREDGING.

The clam-shell dredge *California* worked during July, 1903, in the batture at the east end of the main cut of canal; in August passed farther west in this cut, digging at mouth of Cattail Slough and in Barnett Lake. Returning to Lake Centennial August 28, the dredge worked near the east end of the main cut until September 4. On the following day the dredge removed a mud lump found in the harbor canal about 3,500 feet from the mouth, and the contract with the Atlantic, Gulf and Pacific Company was declared completed. The dredge left Vicksburg for New Orleans, La., September 11, 1903.

The only important single stop was from July 8 to 16, when the dredge was laid up on account of broken main shaft; but there were many minor delays, due principally to waiting for scows while working in Barnett Lake. The large amount of quick sand found in the batture at east end of the main cut made work in this locality slow and difficult for a dredge of the clam-shell type. The greater part of the material moved was recent fill, caused by sedimentation, sloughing of banks, as in Barnett Lake, or, in case of the quick sand, by a lifting of the bottom due to the pressure of the adjacent banks.

TABLE 1.—*Statement of excavation by localities (based on the final estimate).*

Limiting localities.	Excavation during fiscal years—		Total.
	1901–1903.	1904.	
	Cu. yds.	*Cu. yds.*	*Cu. yds.*
Mississippi River to Jackson street dike	1,749,749	383	1,750,132
Jackson street dike to deep water in Lake Centennial	334,588	....	334,588
Deep water in Lake Centennial to Old River	3,578,207	73,583	3,651,790
Bank of Old River to deep water in Old River	99,856	....	99,856
	5,762,400	73,966	5,836,366

In the above table the first stretch constitutes the harbor division of canal, the second lies in the east branch of Lake Centennial, the third is the main cut, and the last lies in the Wrong End of Old River. The excavation given is exclusive of 319,275 yards of fill in the harbor division and 19,526 yards in the Old River stretch of canal; no estimate being given the contractor for these, the first falling under a special agreement with the contractor (see Report of Chief of Engineers, 1901, p. 2059), and the second being traceable to the discharge of material into Old River during December, 1901. There is included in the table 187,291 yards of fill in the harbor division, 30,974 yards in east branch of Lake Centennial, and 73,583 yards of fill in the main cut, removed at Government expense.

TABLE II.—*Monthly output and general conditions under which dredging was done.*

Month.	Output.	Engine hours.	Average haul.	Capacity of dipper.	Ruling material.
1903.	*Cu. yds.*		*Miles.*	*Cu. yds.*	
July	26,820	319	1.98	5½	Quicksand, blue clay, and fine sand.
August	41,707	343	1.71	5½	Fine sand, blue clay, loam, coarse sand.
September	5,439	83	0.59	5½	Fine sand.
Totals and means	73,966	745	1.73	5½	

During early part of July dredged material was deposited in the "crevasse" at south end of the west branch of Lake Centennial against the dam built by the contractors in 1901. When the falling stage made access to this dam impracticable, material was deposited against the Lake Centennial dam, about midway of its length. Later, when dredge was working in Barnett Lake, material was dumped in Lake Centennial on a line parallel to the center line of canal and 600 feet south of that line, the deposit being made opposite the point of debouchment of the main cut of canal into the deep water of the lake.

TABLE III.—*Showing disposition of material dredged during fiscal year 1904.*

Where disposed.	Quantity.
	Cu. yds.
In the crevasse, 600 feet west of West Pass	11,009
On Lake Centennial dam	45,842
In Lake Centennial, east end of main cut	17,115
Total	73,966

For disposition of material 1901 to 1903 see Report of the Chief of Engineers for 1903, page 1393.

The contract price for dredging was 12.4 cents per cubic yard, placing the cost of the 73,966 cubic yards dredged during the fiscal year at $9,171.78. The cost of field superintendence, together with the surveys incident thereto, was $777.

WEST PASS LEVEE.

This levee lies along the left bank of the Mississippi River, beginning about 4,000 feet below King Point, Mississippi, and extending eastward over the narrow strip of land between the west branch of Lake Centennial and the Mississippi to the mouth of the Yazoo Canal. (See map.[a]) Net grade is at 56.4 feet above the zero of the Kleinston gauge, or 4 feet above the high water of 1897 at the mouth of the canal; width of crown is 8 feet; slopes are 3.1 on both sides; length, as originally projected, is about 10,000 feet, and the total fill is about 447,000 cubic yards.

On account of the eddy at Kleinston Landing the water surface is higher at the mouth of the canal than at the neck between Lake Centennial and the Mississippi, and at all stages permitting flow across this neck this eddy, under the conditions heretofore existing, sent a slow current up the harbor canal, the water returning to the river through the west branch of the lake after depositing much of its sediment in the harbor division of the canal. The West Pass levee is designed to stop this circulating current, as well as to guard against a breaching of the neck between the lake and river, which would permit the divertod Yazoo River to reach the Mississippi through the west branch of Lake Centennial instead of flowing along the Vicksburg front through the harbor division of the canal. It is evident that the levee will serve its purpose, as far as the circulating current is concerned, when built upstream to a point where the water surface in the Mississippi is as high as at the mouth of the canal.

Levee sections Nos. 1, 2, and 4 (see map), aggregating 334,500 cubic yards, were let to the firm of Helgason Bros. & Garbish August 5, 1903. By the terms of the contract, section No. 2 and the portion of section No. 4 lying across old West Pass, thence eastward to within 11 stations of the proposed downstream terminus of the levee were to be completed by December 15, 1903; the remainder to be in place by December 1, 1904. This firm also contracted to furnish an outfit for the construction, under Governmental supervision, of levee section No. 3, lying in the narrowest and lowest part of the neck separating the lake and river.

The first levee outfit arrived at mouth of canal August 6; two other outfits arrived during the succeeding week, and the working force and plant was further increased by the purchase of mules and scrapers. At the end of month the force and equipment consisted of 152 men, 114 teams, 77 wheel scrapers, and 5 plows. Work on section No. 3 began on August 8, section 4 on August 10, and section 2 on August 11.

The borrow pits were very low, especally on section No. 3, and thorough drainage had to be maintained during the first month of operation, and, on section 3, throughout the whole period of construction. The Mississippi River maintained an unusally high stage for the season of the year, averaging 15.6 feet on the Kleinston gauge from August to November, as against a general average of 10.1 feet for the same months for the period 1872 to 1902. This stage interfered with the proper drainage of the original pits for section 3, so that they could be worked only by stripping back and forth as the surface dried out, a method that restricted the force that could be usefully employed on this section. In October, these unfavorable conditions continuing, a new borrow pit was opened up on the north side of the old West Pass channel, access to the pit being given by an earth fill (1,300 cubic yards) made across the channel. The force on section No. 2 was then transferred to section No. 3 (October 5) and continued there until November 9, by which line the latter section was so far advanced that its completion before high water by the regular force on this section was assured. The weather was unusually favorable during the whole period of levee construction. Levee section No. 2 was completed December 5, section No. 3 December 9, and the portion of section No. 4 to be completed in 1903, was finished on same day as section No. 3. By December 12 the several outfits had been withdrawn to other work. The portion of levee built in 1903 was sodded March 7 to 19, 1904.

The levee outfit of Helgason Bros. & Garbish moved back on the work May 27, 1904, and began operations at the upstream end of levee section No. 1 on May 30. Good progress was made during the early part of June, but the unusually high river stage during the latter part of that month put sipe water in the borrow pits and the output was greatly reduced. A second outfit arrived on the work June 25, but on account of the river stage has done no levee building to date.

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[a] Not printed.

TABLE IV.—*Cost of section No. 3 of West Pass levee.*

3,457¾ foreman hours, at 30 cents	$1,037.32
22,685½ laborer hours, at 15 cents	3,402.83
67,201¼ team hours, at 50 cents	33,600.63
Superintendence (special)	473.50
Explosives	127.50
Lumber for runways	110.06
Old lumber for foundation of fill in West Pass	150.00
Towing lumber	27.50
Sodding 14 stations, at $2.50 per station	35.00
Cost of 112,365 yards, at 34.7— cents	38,964.34

TABLE V.—*Cost of levee construction during fiscal year.*

Section.	Cubic yards placed.	Cost per cubic yard.[a]	Total cost.
		Cents.	
No. 1	19,944	25.0	$4,986.00
No. 2	109,107	31.5	34,368.70
No. 3	112,365	34.7	38,964.34
No. 4	71,869	32.5	23,357.42
Superintendence			561.50
Total			$102,237.96

[a] Contract price except for section No. 3.

LEVEE PROTECTION.

The greater part of the levee built in 1903 is peculiarly exposed to wave wash, especially on the north side, where the waves have a fetch of about 3 miles down the west branch of Lake Centennial. It was thought advisable to protect the exposed levee slopes in some manner, and a method suggested by Mr. T. G. Dabney, chief engineer of the Yazoo-Mississippi levee district, was adopted. This protection work consists of a series of low bulkheads built longitudinally of levee and stepping up the slopes from toe to crown, the ground between successive bulkheads being terraced to a flat slope. In the present instance the bulkheads were built of 4 by 6 inch posts at 6-foot centers, with two lines of 2 by 6 inch waling, and a sheathing of 2-inch planks placed vertically. The tops of the posts were tied to "deadmen" buried behind the bulkhead next above, by ⅝-inch iron rods, or by several strands of No. 12 wire. The bulkheads were spaced 12 feet apart, and the top of each was 4 feet above that of the one below. In terracing, the original slope of 3:1 was cut to 12:1, half the dirt handled at any terrace being thrown downhill to fill behind the bulkhead supporting the outer edge of that terrace, the other half being thrown over the bulkhead next above. After terracing, each bulkhead showed an exposed face of 3 feet, the sheathing extending 2 feet below the terrace fronting the bulkhead, and the posts running 2 feet deeper. The bulkhead at the top of the series was made higher than the others, showing an exposed face of 6 feet after terracing on its front. This bulkhead was braced by 2 by 6 inch timbers running from the top of its posts to anchor posts set at the edge of the levee crown. All portions of bulkheads that would be inaccessible after construction were painted with tar, except the portion more than 1 foot underground. The painting of the exposed portions was delayed, as the lumber being unseasoned, it was feared that painting completely at this time would result in dry rot.

Bids were asked September 22, 1903, for the construction of this protection work, but the results not being satisfactory, it was decided to do the work by force account. Construction began October 21, with a small force, which was considerably increased November 1. The work was hampered, through its whole course, by the inability of the lumber contractor to furnish material as needed. For this reason only a moderate force could be employed, and the work was not completed until February 20, 1904. The greatest progress was made in December, when 14,000 feet of bulkhead were built and adjacent terracing done, with an average force of 63 laborers. On the north or lake side of levee this protection work begins about 100 feet east of West Pass and extends westward a distance of 3,400 feet, stopping 600 feet short of the upstream end of the levee as built in 1903. On the river side the whole south slope of the levee as built in 1903 is covered by the protection work, except a stretch of 300 feet at the downstream end, where a fringe of willows fronts the levee.

TABLE VI.—*Cost of wave-wash protection.*

Superintendence		$823.61
Labor		6,054.40
Subsistence (for part of labor)		493.66
Teams		905.50
Ferriage, drayage, and freight		69.90
Tie rods, washers, etc., 18,815 pounds		790.23
Wire, No. 12, galvanized, 955 pounds		97.08
Staples, 175 pounds		7.50
Nails, 6,880 pounds		229.50
Miscellaneous, tool handles, etc		4.09
Tar, 84 barrels		314.50
Paint, 5¼ gallons		6.10
Lumber, 658,499 feet B. M		7,906.51
Total		17,702.58
Linear feet of low bulkhead		29,544
Linear feet of high bulkhead		7,692
Square feet of levee slope protected		538,400
Cost per foot of low bulkhead and terracing	cents	44
Cost per foot of high bulkhead	do	+61
Cost per square foot of levee slope protected	do	+03

The recent high water covered all the terraces excepting the one fronting the high bulkhead at the top of the series. No material damage was done, although the highest terrace covered by the water, lake side, was washed down level with the top of the bulkhead on its outer edge for the greater part of its length, and the sodding, placed about one month before, was practically destroyed on all the terraces overflowed. Immediately above West Pass, on river side, about 100 feet of the lower line of bulkhead was undermined by the strong eddy current flowing along the base of the levee, and at four places on the lake side of levee short stretches of bulkhead have been bulged outward by reason of drainage water from the levee reducing the fine sand of the embankment to a semifluid condition. In latter part of February a considerable number of young willows were set out in the borrow pits adjacent to the levee berme, where levee is not already curtained by a timber growth. The trees were planted in strips about 50 feet wide, with about 5-foot intervals between the trees, these being staggered in a direction normal to the levee. Frequent traverses were also planted across the borrow pits to check flow parallel to the levee. Fourteen thousand three hundred and thirty trees were set out, at a total cost of $146.88. It is hoped that by the time the bulkhead protection shall have decayed this timber growth will be sufficiently advanced to afford protection from wave wash.

It being impracticable to build the levee as projected in one low-water season, it became necessary to place a temporary protection on the ends of the partially completed levee to prevent erosion by the high-water flow past these ends. The protection adopted for the downstream end of the levee consists of a mattress, covering the flat-end slope and extending back along the side slopes for a distance of 100 feet from the end of the levee crown, with a foot mat 50 feet wide along the base of the levee, built continuous with the slope mat. The mattress protection is supplemented by a dike extending from the end of levee crown to the toe of the end slope (100 feet) along the center line of the levee, then running on a flat curve, deflecting toward the river for a further distance of 100 feet. The mattress consists of an upper and lower pole grillage with a filling of willow brush in two 8-inch layers between, the two grillage systems being connected by wires passing through the brush. The mattress is ballasted with about 30 pounds of rock to the square foot. The dike consists of three rows of piling, set at 6-foot centers, with a loose filling of brush. The piles were set 10 feet in the ground, and were anchored by planks laid in a ditch 3½ feet deep and resting on crossheads nailed to the piles. The dike has a special foot mat 50 by 50 feet after passing beyond the mat around the base of the levee. A short distance beyond the end of this dike the ground rises about 3 feet, and then runs practically level to the canal, and it was decided to cross this space with a low dike to prevent a concentrated flow through the strip of low ground before the overflow became general. The auxiliary dike consists of two rows of piles with loose brush filling and foot mat 20 feet wide. The piles are anchored similarly to those of the main dike.

The protection adopted for the upstream end of the levee consists of a high bulkhead encircling the end slope and extending back of the end of the crown about 40 feet, then flanking in to the crown with a foot mat, 40 feet wide, around the base of the bulkhead. The dike consists of 30-foot piles set 13 feet in the ground at 6-foot centers, with a sheathing of 2-inch plank extending 7 feet below ground surface. The piles are anchored similarly to those of the dikes at downstream end of levee, but the anchor planks are buried 6 feet in the ground. The mattress is similar to that described above. A fill was made behind the completed bulkhead, having a depth of 7 feet immediately back of the sheathing, with an easy slope thence to the crown of levee. Work on the downstream end began November 2 with a small force. Piling and grillage poles were obtained in the willow flat between De Soto Island and the canal, about 1½ miles from the site of the work. A quantity of willow brush was obtained at the same place, but the greater part of the brush was barged from Longs bar, Louisiana, about 4 miles below the mouth of the canal. The rock used as ballast was part of the first shipment of riprap intended for the permanent protection of the ends of the completed levee, except about 60 tons obtained from a rock outcrop on the left bank of the Mississippi River, about three-fourths mile below the mouth of the canal. The work was completed early in December. Work on the upstream end began November 27. Piling and grillage poles were cut in the adjacent woods; brush was brought from Longs bar and delivered in the west branch of Lake Centennial, the rock ballast being unloaded at the same place. The work was finished December 31.

TABLE VII.—*Cost of protection work, downstream end of West Pass levee.*

(*a*) MATTRESS.

Designation.	Unit cost to nearest cent.	Total cost.
Superintendence [a]		$127.50
Labor, 482 days	$1.25	602.57
Towing, 19 hours	5.00	95.00
Willows, 265 cords	1.01	268.71
Willows, 280 cords	2.39	668.08
Grillage poles, 1,190	.07	80.92
Lumber, 2 by 2 inches, 1,167 feet B. M	12.00	14.00
Wire, No. 12, 1,100 pounds	.03	32.40
Staples, 300 pounds	.03	10.35
Nails, 215 pounds	.03	5.39
Rock, 60 tons	1.26	75.72
Rock, 800 tons	2.59	2,073.60
Squares of mat, 544	7.45	4,054.24

(*b*) MAIN DIKE.

Superintendence, 8 days [a]	$2.50	$20.00
Labor, 90 days	1.25	112.50
Piles, 75	.17	13.05
Brush, 140 cords	2.39	334.04
Wire, 75 pounds	.04	3.00
Nails, 75 pounds	.03	1.94
Lumber, 2,800 feet B. M	15.00	42.00
Length of dike, 200 feet	2.63	526.53

[a] Includes superintendence of brush cutting and hauling brush and rock.

The low dike was 125 feet long and cost $123.61, or 98 cents per running foot, the distribution of cost being practically as in the main dike.

TABLE VIII.—*Cost of bulkhead at upstream end of West Pass Levee.*

Designation.	Unit cost to nearest cent.	Total cost.
Superintendence, 33 days	$2.00	$66.00
Labor, 232 days	1.25	290.00
Piles, 53	.23	12.19
Lumber, 22,752 feet, board measure	14.11	321.02
Nails, 725 pounds	.03	18.68
Backfill		548.58
Length of bulkhead, 370 feet	3.40	1,256.47

The mattress at the upstream end of levee comprised 148 squares, constructed for $1,323.17, or $8.95 per square. The distribution of cost is practically the same as for the mattress at the downstream end, except that the rock and brush have a larger proportionate cost, on account of the longer haul. The cost of the mattress work does not compare favorably with that of similar work on the river bank, the extra cost being due to the frequent handling of material and the large amount of wagon haul. Thus the rock (60 tons excepted) cost $2 per ton as delivered on barges, 33 cents per ton for unloading, and 26 cents per ton for hauling to the downstream mat (500 feet), or 43 cents for hauling to the upstream mat (1,400 feet). The cost per cord of the willows brought from Longs bar is made up of the following items: Cutting privilege, 1.9 cents; cutting, 24.5 cents; loading, hauling to bank, and unloading, 37.5 cents; loading on barges, towing, and unloading, $1.40; loading, hauling to mattress, and unloading, 34.7 cents for the downstream end of levee and 53.4 cents for the upstream end, or a total of $2.386 and $2.573 for the two ends, respectively.

There was a strong outflow from Lake Centennial to the Mississippi around both ends of the levee from April 5 to May 26, 1904. No damage was done to the levee ends, but considerable scour occurred beyond the mattresses.

In September a contract was entered into with Mr. Oscar F. Barrett, of Cincinnati, Ohio, for 6,300 tons of riprap and 600 tons of spalls. The contract price was $2 per ton, delivered on barges at Vicksburg, Miss. The rock is designed for the permanent protection of the ends of the completed levee. One thousand and fifty-four tons were delivered in November, and used as already described. The delivery of the remainder was delayed, by request, until the high-water season, when the conditions for unloading would be more advantageous. Delivery was resumed March 26 and terminated May 28, 1904, when 6,231 tons of riprap and 520 tons of spalls had been furnished. Four thousand three hundred and thirty-six tons of riprap and 345 tons of spalls were unloaded at the mouth of the canal; 254 tons of riprap, part of the first consignment, were unloaded at the south end of the west branch of Lake Centennial, the remainder being unloaded on the river bank near the proposed upstream terminus of the levee. The first consignment was unloaded by contract at the unit price of 33 cents per ton, delivered on top bank. The remainder was unloaded on force account; 2,881 tons being unloaded with wheelbarrows, average lead of 150 feet, at a cost of 19.7 cents per ton; and 2,296 tons were thrown overboard, the barges having been floated over the dumping ground, at a cost of 8.6 cents per ton. The 520 tons of spalls were thrown overboard at a cost of 22.8 cents per ton, the increase being due to sorting out the acceptable spalls from a quantity of undersized material. The total cost of the 6,751 tons of rock, unloaded, is $14,732.51, of which $2,455.82 is included in the cost of the temporary protection of the levee, already given.

SURVEYS AND EXAMINATIONS.

Up to the cessation of dredging daily soundings were taken close in front of and immediately behind the dredge. In July longitudinal soundings were taken through the harbor division of canal and in Old River, and the main cut was cross sectioned at alternate full stations. In August longitudinal soundings were taken through the entire canal, and cross sections taken wherever the first system of soundings showed an inadequate depth.

The longitudinal soundings were repeated each month up to December, when a general low water survey was made. The canal was cross sectioned at intervals of about 1,000 feet. Where practicable, soundings were located by a tagged steel cable stretched across the channel, and points between the water surface and top bank were determined by stadia location and transit elevations. Wye levels were run to water surface at the cross-sections. Longitudinal soundings were made through the canal in May, and the December survey was duplicated in June. Surveys were made at the old mouth of the Yazoo River in August, and again in December, both covering the same ground as the survey of November, 1902. (See Report of Chief of Engineers, 1903, p. 1388.) In November a survey was made along the left bank of the Mississippi from King Point to mouth of canal. The river was cross sectioned at 1,000 foot intervals, from top bank to channel line, the ground covered being the same as that embraced by the survey of November, 1902. (See Report of Chief of Engineers, 1903, p. 1389.)

A series of slope gauges has been maintained along the canal, readings being taken twice a week. A number of gauges were also set along the left bank of the Mississippi River from King Point to Kleinston and read on alternate days during the recent high water.

No marked changes occurred in the canal from the cessation of dredging up to December; those deserving mention being a shoaling in portions of Barnett Lake, due to sloughing in of the mud banks as the water fell, and a fill opposite the mouth of Glass Bayou, referable to material brought down by that stream. During December the average stage of the Mississippi was 4.2 feet (Kleinston gauge). This low stage brought about a heavy slope through the canal, and the high velocity induced in the discharge resulted in considerable scour, especially in the harbor division. In the main cut the narrowest low water width found was 96 feet at head of cut, followed by 100 feet about midway of the Barnett Lake stretch. The minimum depth found was 7.4 feet at east end of Barnett Lake, the stage being 3.1 feet on the Kleinston gauge. The bottom rose above grade line at seven points, the maximum amount being 3.4 feet at east end of main cut. For the harbor division the least low water width was 111 feet and the minimum depth was 10.7 feet, for a stage of 0.7 foot at Kleinston. Nowhere in this stretch of canal was the bottom less than 2 feet below grade. Both banks of the cut through Barnett Lake sloughed badly, and sloughing was pretty general through the harbor division, but was not serious at any one point.

The June survey shows an average lowering of 2.6 feet in the thalweg of the channel through the main cut, when compared with the December survey; and bottom is generally below canal grade, the only important exception being about half way between Barnett Lake and Lake Centennial, where a stretch of 800 feet averages 1.5 feet above grade. From Lake Centennial to the Mississippi the thalweg of canal has gone down an average amount of 0.9 foot since December, and is everywhere below grade. Considerable caving has occurred on the left bank of the canal at the head of the main cut, the tendency being for the diversion channel to shift to a position normal to the bank line of Old River. With this exception, the banks of the canal have been fairly stable.

The slope through the canal is subject to erratic fluctuations, as it depends on the relative stages in the Yazoo and Mississippi, and more especially on the rate of variation of the stage in the latter stream. On December 30, when the stage at Kleinston was 1.9 feet and rising slowly, the fall from Old River to Lake Centennial was 4 feet, the fall thence to the Mississippi being 4.8 feet. On January 30 with a stage of 14 feet at Kleinston, and rising rapidly, the slope was negative; there being a fall of 0.07 foot from the mouth of canal to Old River. The above represents the extreme observed values assumed by the slope during the fiscal year.

From December 1 to January 26 the average observed fall from Old River to Lake Centennial was 2.38 feet, that from Lake Centennial to the Mississippi being 2.77 feet, the average stage at mouth of canal being 4.41 feet for the thirteen days on which observations were taken. From April 2 to May 25, when the average stage was 43.34 feet for the sixteen days of observation, the average observed fall from Old River to Lake Centennial was 0.56 foot; thence to the Mississippi, 0.42 foot. The above may be taken as representative low and high water slopes.

The current in the canal has been outward (toward the Mississippi River) throughout the year, except on January 30, on which date a slow inward current was observed, extending from the mouth of the canal to Old River. This current is referable to a rapid rise in the Mississippi, which from January 28 to 31 averaged 3.5 feet per day.

Navigation in the canal was uninterrupted throughout the year. The small water width during December and January inconvenienced the larger Mississippi River boats to some extent, but the depth was ample.

During the recent high water a considerable flow was observed across the willow flat west of the harbor canal and south of De Soto Island, the direction being from the west branch of Lake Centennial toward the canal, except that near the mouth of the canal the cross flow was deflected toward the Mississippi. No material damage was done this season, but the extension of the West Pass levee upstream will undoubtedly accentuate this cross flow. No danger is apprehended as long as the flat remains covered with a thick timber growth; but should the land be cleared and put into cultivation, it is possible that a channel might be formed from the west branch of the lake to the canal at some point south of De Soto Island.

The slope observations on the Mississippi River, mouth of canal to King Point (April 8 to May 14), show that the Kleinston eddy extended on an average to a distance of 6,000 feet above the mouth of the canal for an average stage of 44.8 feet, the extreme positions being 3,400 feet farther upstream (on two dates) and 1,700 feet downstream from the average limit (on nine dates).

The November survey of the Mississippi bar fronting the West Pass levee, when compared with the survey of December, 1902, shows some fill from King Point down to the "crevasse" (see map). Opposite West Pass the deep water contours have come in about 20 feet, indicating scour; half way between the pass and mouth of the canal these contours are unchanged, and at the mouth of the canal they have come in about 30 feet. The August (1903) survey of the old mouth of the Yazoo shows very irregular changes since the survey of December, 1902. A maximum fill of 25 feet is shown in one place, and some scour is found in the chute back of the towhead at the mouth of the river. At the shoalest section found in the Yazoo proper a fill of 10 to 15 feet is indicated, and a fill, averaging roughly at 8 feet, extends up the Yazoo for a distance of 2,500 feet.

The flow at the old mouth has been from the Mississippi to the Yazoo for much the greater part of the time, the contrary being the case only when the former river was dropping rapidly. This mouth went dry on September 8 with 14.8 feet on the Kleinston gauge, but the bar was overtopped a few days later by a rise in the Mississippi, and the inflow then set up continued to November 22, when the bar came out at a stage of 11.2 feet, and remained out until the latter part of January.

The December survey, compared with that of August, shows a marked fill in the chute behind the towhead, some scour across the bar at the mouth of the Yazoo, and a corresponding fill farther up in that stream.

No definite estimate can be made at this time of the funds that may be required for this work during the fiscal year ending June 30, 1906, as this will depend on the natural changes that may take place in the canal before a stable regimen is reached.

A map showing the route of the canal from the Mississippi River to Old River, with impounding and training dikes, is published in the report of the Chief of Engineers for 1902, page 1422, and a map showing the Yazoo, Old, and Mississippi rivers in the vicinity of Vicksburg is published in the report of the Chief of Engineers for 1894, page 1494. A map showing the West Pass levee and the canal from the Mississippi River to deep water in Lake Centennial is submitted herewith.

Very respectfully, your obedient servant,

T. C. Thomas,
Assistant Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

V 6.

IMPROVEMENT OF YAZOO, TALLAHATCHIE, AND BIG SUNFLOWER RIVERS AND TCHULA LAKE, MISSISSIPPI.

In July, 1903, the plant used upon this work was repaired at Vicksburg, Miss. The snag boats *Columbia* and *Thos. B. Florence*, a quarter boat, and a small flatboat for use with a pile driver were fitted out and ready to resume work early in August.

During the fiscal year ending June 30, 1904, operations were as follows:

(A) YAZOO RIVER.

The U. S. snag boat *Columbia*, James H. Britton, master, was employed in Yazoo River from August 10 to January 31. Operations extended over the entire river from mouth to head, and the following obstructions to navigation were removed:

Snags pulled	1,491
Stumps pulled and destroyed	513
Logs removed from channel	65
Shore snags cut	194
Leaning trees felled	23
Linear feet of brush wing dam built at McCormick bar	125
Wreck removed (part of steamboat *Mary E. Keene*, burned 1863 at French Bend)	1

After suspending operations in Big Sunflower River, the party which had been employed in that stream worked down the Yazoo River to its mouth, October 15 to 31, and removed the following obstructions to navigation:

Stumps cut and destroyed	95
Shore snags cut	234
Leaning trees felled	1,560

The U. S. snag boat *Thos. B. Florence* was transferred from the Tallahatchie River October 24, and worked in Yazoo River until December 17, removing the following obstructions to navigation:

Snags pulled	118
Stumps pulled and destroyed	202
Logs removed from channel	36
Shore snags cut	109
Side jam broken up and destroyed	1
Leaning trees felled	5
Leaning trees topped	4
Wreck removed (sunken flatboat near Woodstock)	1

Money statement.

July 1, 1903, balance unexpended		$21,835.01
Amount received from sale of property		8.71
		21,843.72
June 30, 1904, amount expended during fiscal year, for maintenance of improvement		10,481.65
July 1, 1904, balance unexpended		11,362.07
July 1, 1904, outstanding liabilities		37.14
July 1, 1904, balance available		11,324.93
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For new steel snag boat	$60,000.00	
For maintenance of improvement	[a]15,000.00	
		75,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

(B) TALLAHATCHIE RIVER.

The U. S. snag boat *Thos. B. Florence*, T. G. Ledbetter, master, worked in Tallahatchie River from August 5 to October 23, between its mouth and Sharkey, and removed the following obstructions to navigation:

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[a] Biennial appropriation should be $30,000.

Snags pulled	394
Stumps pulled and destroyed	244
Logs removed from channel	174
Shore snags cut	143
Side jams broken up and destroyed	2
Leaning trees felled	104
Leaning trees topped	11
Square yards of willows and brush cut	30

Money statement.

July 1, 1903, balance unexpended	$4,081.68
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	3,165.80
July 1, 1904, balance unexpended	915.88
July 1, 1904, outstanding liabilities	1.67
July 1, 1904, balance available	914.21
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	[a] 2,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

(c) BIG SUNFLOWER RIVER.

August 1 and 2 the U. S. snag boat *Columbia* towed a quarter-boat from Vicksburg to Campbellsville, on Big Sunflower River, and August 3 to 9 the snag boat worked between the head of Muscle shoals and the mouth of the river. The snag boat was employed again in Big Sunflower River from February 1 to 12 between the mouth and Hughes Landing, a distance of about 42 miles. In these periods the following obstructions to navigation were removed:

Snags pulled	121
Stumps pulled	18
Logs removed from channel	21
Shore snags cut	16
Mud lump destroyed at Muscle shoals	1
Wreck removed (part of sunken horse-power boat at head of Cypress Bend)	1

From August 5 to October 14 a party equipped with tools, tackle, explosives, etc., under Overseer James H. Bobbs, worked in lower Big Sunflower River between the head of Muscle shoals and the mouth of the river, building wing dams to close chutes and to contract and scour the channel, and removing obstructions from the channel and banks. The following is a summary of the work performed:

Wing dams built (total length, 3,665 feet)	25
Old dams repaired and strengthened	3
Logs removed from channel	314
Stumps pulled, cut, and destroyed	310
Shore snags cut	647
Leaning trees felled	25
Square yards of willows and brush cut	300
Wreck removed (sunken barge in Cypress Bend)	1

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[a] Biennial appropriation should be $5,000.

Money statement.

July 1, 1903, balance unexpended	$13,678.82
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	4,796.44
July 1, 1904, balance unexpended	8,832.38
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	[a]3,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

(D) TCHULA LAKE.

Work in Tchula Lake was not resumed during the year.

Money statement.

July 1, 1903, balance unexpended	$1,184.44
July 1, 1904, balance unexpended	1,184.44
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	4,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

Reference is invited to the appended report of Assistant Engineer T. C. Thomas under whose local supervision the work was conducted.

A new snag boat for this system of rivers has become an urgent necessity, and the recommendation for a steel-hull boat to replace the *John R. Meigs*, destroyed in war service six years ago, is repeated.

List of appropriations.

By act of—	Yazoo River.	Tallahatchie River.	Big Sunflower River.	Tchula Lake.	Total.
March 3, 1873	$40,000.00				$40,000.00
March 3, 1875	12,000.00				12,000.00
August 14, 1876	15,000.00				15,000.00
June 18, 1878	25,000.00				25,000.00
March 3, 1879	15,000.00	$6,000.00	$20,000.00		41,000.00
June 14, 1880	12,000.00	9,000.00	8,000.00		29,000.00
March 3, 1881	6,000.00	3,000.00	4,000.00	$3,000.00	16,000.00
August 2, 1882	8,000.00	3,000.00	5,000.00	2,500.00	18,500.00
July 5, 1884	10,000.00	3,000.00	5,000.00	1,500.00	19,500.00
August 5, 1886	15,000.00	3,500.00	5,000.00	2,000.00	25,500.00
August 11, 1888	32,000.00	5,000.00	5,000.00	3,000.00	45,000.00
September 19, 1890	25,000.00	5,000.00	5,000.00	3,000.00	38,000.00
July 13, 1892	20,000.00	5,000.00	5,000.00	3,000.00	33,000.00
August 18, 1894	20,000.00	4,000.00	5,000.00	3,000.00	32,000.00
June 3, 1896	20,000.00	4,000.00	5,000.00		29,000.00
March 3, 1899	20,000.00	5,000.00	5,000.00		30,000.00
June 13, 1902 (allotments)	21,000.00	10,000.00	20,000.00	4,000.00	55,000.00
Total amount appropriated	316,000.00	65,500.00	97,000.00	25,000.00	503,500.00
Total amount expended	304,637.93	64,584.12	88,117.62	23,815.56	481,155.23
Balance unexpended	11,362.07	915.88	8,882.38	1,184.44	22,344.77

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[a] Biennial appropriation should be $6,000.

COMMERCIAL STATISTICS.

(A) YAZOO RIVER.

Yazoo River was navigable from mouth to head the entire fiscal year.

List of boats engaged in navigation of Yazoo River during the fiscal year ending June 30, 1904.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Peri[a]	Stern-wheel.	71	102	25.5	4.0	......	......	New Orleans and Greenwood.	1	......
C. J. Reynolds[a]	....do	71	112	22.1	2.6	2.0	2.0	New Orleans and Satartia.	1	......
Rees Pritchard	....do	196	150	31.0	3.3	1.8	4.0	Vicksburg and Greenwood.	58	1,100
Hallette	....do	196	161	30.5	4.5	2.5	5.5	.....do	58	
City of Knoxville	....do	140	130	18.0	3.0	2.3	3.5	Yazoo City and Big Sunflower River.	164	1,000
City of Greenwood	....do	97	130	28.0	3.5	2.5	4.5	Yazoo City and Belzona.	164	1,800
F. Weyerhauser[b]	....do	216	140	31.0	4.5	3.0	4.5	Vicksburg and Steele Bayou.	1	......
H. C. Brockman[b]	....do	75	91	22.6	3.8	2.0	3.0	.....do	1	......
Warrenn[b]	....do	144	1[illegible]4	26.0	4.0	2.0	4.0	Vicksburg and Big Sunflower River.	1	......
Edna[a][b]	....do	78	70	21.4	3.0	2.2	2.8	Vicksburg and— Greenwood Lower points on Yazoo River.	 2 3	 ....
Modoc[a]	....do	27	64	14.0	2.5	1.2	1.6	Vicksburg and— Adams Landing Yazoo City	 4 2	
Kennedy	....do	140	121	24.4	3.9	2.3	3.3	Yazoo City and— Satartia Belzona	 10 25	 ....
Stella	....do	83	101	25.0	3.0	1.7	4.0	Yazoo City and— Satartia Belzona	 22 24	 ....
Jack Osborn	....do	125	120	30.0	5.0	1.9	3.5	Greenwood and Belzona.	72	965
Vernie Mack[b]	....do	122	127	24.7	4.9	......	......	Old mouth Yazoo and Vicksburg.	......	......
Joe Seay[a]	Tug......	[illegible]7	75	16.0	6.6	7.0	8.0	Vicksburg and— Adams Landing Yazoo City	 4 2	 ....
Angelina M.[a]	Gasoline.	13	45	10.0	3.0	1.5	1.5	Vicksburg and Satartia.	7	......
Edna[a]	....do	13	47	11.0	3.1	1.5	1.5	Vicksburg and Murphy bar.	15	......
Cody Hull[a]	....do	9	65	12.8	2.0	1.3	2.1	Vicksburg and various points as high as Yazoo City.	......	......
Pride of Virginia[a]	....do	14	50	12.0	2.5	1.5	1.7	Vicksburg and Big Sunflower River.	38	......
Stella Guynn[a]	....do	14	50	12.0	2.5	1.3	1.7	.....do	27	......
Elk[a]	....do	......	......	......	......	1.0	......	Vicksburg and Fletchers Landing.	52	......
Hazel (tug)[a]	....do	......	......	......	......	3.0	3.5	Vicksburg and Harters Landing.	75	100
Queen[a]	....do	......	......	......	......	1.5	2.0	Vicksburg and Yazoo River points.	......	......

[a] With barges.

[b] With rafts.

Summary of commerce reported for Yazoo River.

Articles.	1903-4.	Articles.	1903-4.
	Tons.		*Tons.*
Cotton	12,860	Saw logs	62,648
Cotton seed	17,596	Coal	2,000
Hides and skins	26	Miscellaneous freights	5,872
Live stock	453		
Lumber	21,162	Total freight for Yazoo proper	146,477
Staves	16,262	Total freight for tributaries	139,972
Provisions	4,896		
Grain	2,702	Total for Yazoo and tributaries	286,449

Estimated value:	
Yazoo proper	$4,595,620
Yazoo and tributaries	7,260,686

(B) TALLAHATCHIE RIVER.

Tallahatchie River was navigable the entire fiscal year to Philipp, and to mouth of the Coldwater during half that time. The year was one of unusually low water.

List of steamboats engaged in the navigation of Tallahatchie River during the fiscal year ending June 30, 1904.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft. Light.	Draft. Loaded.	Between—	Round trips.	Passengers.
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Peri[a]	Stern-wheel	71	102	25.5	4	......	......	New Orleans and Money Landing.	1	....
Choctaw	do	223	127	24.0	4	1.7	3.5	Greenwood and mouth of Coldwater, Duncans.	86	....
Alda	do	73	121	21.0	4	1.8	3.5	Greenwood and Tallahatchie River points.	....	....

[a] With barges.

Summary of commerce reported.

Articles.	1903-4.	Articles.	1903-4.
	Tons.		*Tons.*
Cotton	3,600	Provisions	673
Cotton seed	7,375	Grain	573
Hides and skins	26	Miscellaneous freights	1,681
Live stock	60		
Lumber	625	Total	15,965
Staves	1,352		

Estimated value, $1,188,641.

(C) BIG SUNFLOWER RIVER.

River reported navigable the entire year for light-draft boats from the mouth to Osceola. The head of high-water navigation was Faisonia, February 1 to May 1.

List of boats engaged in the navigation of Big Sunflower River during the fiscal year ending June 30, 1904.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
City of Knoxville	Stern-wheel.	140	130	18.0	3.0	2.3	3.5	Yazoo City and Campbellsville.	90	500
Shawnee[a]	do	12	......	......	......	1.2	2.0	Mouth of Sunflower and Campbellsville.	20	10
Rees Pritchard	do	196	150	31.0	3.3	1.8	4.0	Yazoo City and Campbellsville.	5	100
City of Greenwood	do	97	130	28.0	3.5	2.3	4.5	do	5	75
Peri[a]	do	71	102	25.5	4.0	......	......	New Orleans and Doddsville.	1	....
Warrenn[b]	do	144	134	26.0	4.0	2.0	4.0	Vicksburg and Campbellsville.	1	....
Edna[b]	do	78	70	21.4	3.0	2.2	2.8	Vicksburg and Osceola.	1	....
Wichita	do	97	130	28.0	3.5	1.5	3.0	do	18	100
Modoc[a][b]	do	42	64	14.0	2.5	1.2	1.6	Vicksburg and Kearney.	2	....
Osage[b]	do	96	108	22.0	3.5	2.0	3.0	Vicksburg and Campbellsville.	....	....
H. C. Brockman	do	90	100	24.0	4.0	2.0	3.3	do	....	....
Pride of Virginia[a][c]	Gasoline.	14	50	12.0	2.5	1.5	1.7	Vicksburg and Osceola.	38	....
Stella Guynn[a][b]	do	14	50	12.0	2.5	1.3	1.7	do	27	....
Cody Hull	do	9	65	12.8	2.0	1.3	2.1	Vicksburg and Shell Ridge.	....	....
Hazel (towboat)	do	14	53	12.0	2.8	1.0	1.7	Woodburn and Vicksburg, Yazoo City.	50	....
Hester[b]	do	90	50	12.0	4.0	1.5	2.0	Vicksburg and Osceola.	....	....
Edna[b]	do	14	47	11.0	3.1	1.5	2.0	do	....	....
Jessie Blair[b]	do	15	65	12.0	3.0	1.5	1.5	do	....	....
Constance[b]	do	10	36	10.0	2.0	1.0	1.5	do	....	....

[a] With barges. [b] With rafts. [c] As rebuilt.

Summary of commerce reported for Big Sunflower River.

Articles.	1903–4.	Articles.	1903–4.
	Tons.		*Tons.*
Cotton	1,836	Provisions	3,112
Cotton seed	8,025	Grain	816
Hides and skins	12	Saw logs	100,560
Live stock	100	Miscellaneous freights	4,125
Lumber	2,025		
Staves	570	Total	121,181

Estimated value, $1,354,470.

(D) TCHULA LAKE.

Tchula Lake was navigable from February to May. The water is reported to have reached a navigable stage in the lake (8 feet above low water in the Yazoo) at a later date than in the twenty years preceding, which explains the limited commerce for the fiscal year.

List of boats engaged in navigation of Tchula Lake during the fiscal year ending June 30, 1904.

Name.	Class.	Tonnage.	Length.	Breadth.	Depth.	Draft.		Between—	Round trips.	Passengers.
						Light.	Loaded.			
			Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*			
Rees Pritchard	Stern-wheel.	196	150	31	3.3	1.8	4.0	Head and foot of lake	3	15
City of Greenwood	do	97	130	28	3.5	2.5	4.5	do	8	50
Kennedy	do	140	121	24.4	3.9	2.3	3.3	do	10	....

Summary of commerce reported.

Articles.	1903–4.	Articles.	1903–4.
	Tons.		*Tons.*
Cotton	175	Provisions	412
Cotton seed	938	Grain	400
Hides and skins	1	Miscellaneous freights	225
Live stock	50		
Lumber	625	Total	2,826

Estimated value, $121,955.

REPORT OF MR. T. C. THOMAS, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Vicksburg, Miss., June 30, 1904.

COLONEL: I have the honor to report on snagging operations and other improvement work in the Yazoo River and its navigable tributaries during the fiscal year ending June 30, 1904.

(A) YAZOO RIVER.

Snagging began in this stream August 10, when the snag boat *Columbia*, James H. Britton, master, entered it from the Sunflower. The *Columbia* worked upstream, cutting shore snags and stumps principally, as the stage was too high for effective channel work, and reached Greenwood September 5. The boat then turned and worked down the river to its mouth; then back upstream to its head at the junction of the Tallahatchie and Yalobusha (October 30). The water had then dropped to an unusually low stage in the upper river, and attention was confined to channel work; the river having been worked over several times from its head to the mouth of the Big Sunflower as the river fell to successive lower stages. The *Columbia* was transferred to the Big Sunflower February 1, on account of a rise of the Yazoo.

The snag boat *Florence*, Thacker G. Ledbetter, master, was transferred from the Tallahatchie to the Yazoo October 24, and worked over the river from the foot of Tchula Lake (102 miles above the mouth of the Yazoo) to French Bend (165 mile point.) The boat ran into Vicksburg December 3 to secure a new crew, then returned to Satartia (47 mile point). The Satartia bar and the stretch immediately below were in very bad condition and kept the *Florence* employed until December 16. On the 17th, while working at Burnside, a rudder post was broken, and the boat returned to Vicksburg and was laid up.

The party of Overseer James H. Bobbs, with U. S. quarter boat *No. 2*, was transferred from the Big Sunflower to the Yazoo October 15, and worked downstream from L'Argent (40 mile point) to the mouth of the river, reaching the latter point October 31, when the party was transferred to other work. The stage in the lower end of the Yazoo was comparatively high throughout the working season, and the work of the quarter-boat party was confined to cutting shore snags and leaning trees, principally.

The working season in the upper Yazoo was very favorable, both in the lowness of the river stage and in its duration, and it is believed that the river is now in fair condition as far as channel obstructions are concerned.

The river was inspected by me from the mouth to L'Argent Landing, in January; and from Satartia to Greenwood by Asst. Engineer Walter H. Polk, in October.

Summary of work done and field cost of same.

Distribution of work.	Columbia.	Florence.	Quarter boat.	Total.
Snags pulled	1,491	118		1,609
Stumps pulled, cut, and destroyed	513	202	95	810
Shore snags cut	194	109	234	587
Logs removed from channel	65	36		101
Side jam broken up and destroyed		1		1
Leaning trees felled	23	5	1,560	1,588
Leaning trees topped		4		4
Wing dams built[a]	[b]125			[b]125

[a] At McCormicks bar.

[b] Linear feet.

Summary of work done and field cost of same—Continued.

Distribution of cost.	Columbia.	Florence.	Quarter boat.	Total.
Services	$4,779.00	$1,380.49	$229.66	$6,389.15
Material expended	367.59	273.00	....	640.59
Subsistence	888.01	228.91	47.82	1,164.74
Total field cost	6,034.60	1,882.40	277.48	8,194.48

Time employed.

	Months.
Columbia	5.7
Florence	2.0
Quarter boat	.5

Part of the wreck of the *Mary E. Keene*, burned 1863, was removed at French Bend, and the wrecks of flatboats were removed at Woodstock, Annadale, and Holly Bend.

It is believed that $15,000 can be advantageously expended in this stream during the fiscal year ending June 30, 1906, exclusive of new plant.

(B) TALLAHATCHIE RIVER.

The snag boat *Thos. B. Florence*, Thacker G. Ledbetter, master, left Vicksburg August 1 and reached the mouth of the Tallahatchie August 5. The stage being too high for effective channel work, operations were at first confined to removing shore snags and stumps and to clearing the timber from slides. The river was covered from the mouth to Sharkey (68 miles from the mouth) by August 18. The river had then fallen to a stage favorable for channel work, and the boat returned to the lower river. The stream was worked over in successive stretches, the boat dropping to the lower end a of stretch and working upstream to the lower end of the stretch next above. The river was gone over in this way from the mouth to Duncans (52 mile point), August 19 to October 23, a specialty being made of channel snags and sunken logs. A number of the bars were paved with these sunken logs, which prevented the scouring out of a low-water channel. The logs were caught with grab hooks and lifted until a hoisting chain could be passed around them. Where this was impracticable the logs were destroyed by dynamite. October 24 the *Florence* was transferred to the Yazoo river.

Except for the month of August the river stage was peculiarly favorable to snagging operations; and, although many sunken logs remain in the channel, the river is believed to be free from dangerous obstructions from the mouth to Swan Lake (66 mile point), the head of ordinary low-water navigation.

SUMMARY OF WORK DONE AND FIELD COST OF SAME.

Snags pulled	394
Stumps pulled, cut, and destroyed	244
Shore snags cut	143
Logs removed from channel	174
Side jams broken up and destroyed	2
Leaning trees felled	104
Time employed, months	2.8
Services	$2,037.42
Material expended	$282.79
Subsistence	$370.26
Total field cost	$2,690.47

The river was inspected by Assistant Engineer Walter H. Polk from its mouth to Philipp (44-mile point) October 8 to 10, 1903.

It is believed that $3,000 can be advantageously expended in this stream during the fiscal year ending June 30, 1906.

(C) BIG SUNFLOWER RIVER.

The snag boat *Columbia*, with U. S. quarter boat No. 2 in tow, left Vicksburg August 1, entered the Big Sunflower the following day, and proceeding up that stream, reached Muscle shoals, 37 miles above the mouth, August 5. The *Columbia* dropped the quarter-boat party there, and, returning to Alligator Chute (14-mile point), worked upstream to the Bonnie place (23-mile point) removing channel obstructions.

The boat was unable to proceed further on account of low water, and was transferred to the Yazoo River work August 10. The *Columbia* reentered the Sunflower February 1 and worked upstream to Hughes Landing (42-mile point), paying almost exclusive attention to channel obstructions. The river was in good condition from Hughes to Osceola (88-mile point) and as the stage was too low for operating beyond the latter point the *Columbia* returned to Vicksburg and was laid up February 13.

The quarter-boat party, James H. Bobbs, overseer in charge, worked down the river from Muscle shoals to the mouth, August 5 to October 14, 1903. Shore snags were cut, stumps blasted, slides cleared, and leaning trees felled. Many logs found in the river channel were destroyed with dynamite.

The principal work of this party was the construction of wing dams. These consisted of two rows of piles at 4-foot centers, with a filling of brush between the rows. The tops of the dikes were placed about 3.5 feet above low water. The piles were driven with a hand pile driver mounted on a barge 16 by 40 feet. In many places the wing dams caused the bars to shift a short distance downstream, and it was necessary to prolong the dams in a direction parallel to the channel to secure satisfactory results.

Summary of work done and field cost of same.

DISTRIBUTION OF WORK.

	Columbia.	Quarter-boat party.	Total.
Snags pulled	121	....	121
Stumps pulled, cut, and destroyed	18	310	328
Shore snags cut	16	647	663
Logs removed from channel	21	314	335
Leaning trees felled	....	25	25
Square yards of brush cut	....	300	300
Number of wing dams built	....	25	25
Old dams repaired	....	3	3
Linear feet of wing dams built	....	4,140	4,140

DISTRIBUTION OF COST.

	Columbia.	Quarter-boat party.	Total.
Services	$595.67	$1,457.84	$2,053.51
Material expended	61.00	116.63	177.63
Subsistence	121.59	280.69	402.28
Total field cost	778.26	1,855.16	2,633.42

Time employed.

	Months.
Columbia	0.7
Quarter-boat party	2.5

The wreck of a horse-power boat (no name) was removed from the head of Cypress Bend, and the wreck of a barge was destroyed with dynamite lower down in same bend.

Tabulated statement of wing dams built.

Locality.	No. of dikes.	Depth found.	Gain in depth.	Remarks.
		Feet.	Feet.	
Muscle shoals	2	[a]3.2	0.3	Blue clay and shells. Channel contracted to 60 feet.
Sandy Bayou	2	[a]2.7	.6	Blue clay.
Head of Little Sunflower	1	[a]2.7	.3	Blue clay and shells.
Head of Cuba Island	1	....	....	To close chute on right.
Foot of Cuba Island	2	[a]2.6	.4	Gravel and shells.
One-half mile above Choctaw	2	[a]2.4	.8	Do.
Upper end Cypress Bend	3	[a]2.4	1.1	Sandy bottom.
Lower end Cypress Bend	2	[a]2.4	.6	Do.
Head of Alligator Chute	1	....	....	Closing Mabin Chute.
Eloise Landing (below)	3	2.0	1.0	Sandy bottom.
Fairview Landing	4	....	....	Do.
Spanish Fort	1	....	....	Blue clay and shells.
Two-mile Crossing	1	....	....	Sandy bottom,

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[a] Stage estimated to be from 1 foot (Muscle shoals) to 0.5 foot (Cypress Bend) above low water.

The river was inspected from its mouth to Hollands Landing (65-mile point) January 20 to 23, the stage being unusually low at the time. Wing dams were in good condition, and the shoalest water found was 1.7 feet at Fairview, the ruling depth over the bars being 2 feet.

It is believed that $3,000 can be advantageously expended in this stream during the fiscal year ending June 30, 1906.

TCHULA LAKE.

No work was done in this waterway during the fiscal year. The whole lake was worked over in 1895, and the lower half in 1902. In the latter year the upper half was reported somewhat obstructed in places by recent willow growth, and it is thought that this stretch will require attention within the next two years. It is estimated that $4,000 can be expended to advantage during the fiscal year ending June 30, 1906.

REPAIRS TO PLANT, ETC.

The *Columbia* and quarter boat *No. 2* were placed in dock at Greenville, Miss., April 20 to May 11, for general repairs. New planking was placed on the forward rake of the *Columbia*, and a considerable number of defective planks on the sides and bottom of the hull were replaced by new. New bottom planking was placed on the quarter boat and all defective deck beams were removed and new ones put in. The hulls of both boats were recalked and all seams painted. The cost of this work, including the trip to and from Greenville, was $1,272.48 for the *Columbia* and $380.51 for the quarter boat.

The plant at present assigned to the Yazoo River and its tributaries consists of the *Thos. B. Florence*, a small stern wheel boat with model iron hull; the *Columbia*, a somewhat larger boat with scow-built wooden hull; and a quarter boat with wooden hull, having accommodations for eighteen laborers and two officers. The *Florence*, built in 1875 and repaired in 1885, was again placed in thorough repair in 1900, the hull having been resheathed and a new boiler installed. This boat now is in good condition, but her draft is too great for operations in the Yazoo system at the lowest stages, and her lifting power is limited on account of her model bow.

The present hull of the *Columbia* was built in 1900, and an inspection made while the boat was in dock (April, 1904) showed that it is badly decayed and could not be expected to last more than about two years longer. The boiler of the *Columbia* was taken from an old hydraulic dredge and is unsafe; and her main engines, while in fair condition, are old and of an antiquated pattern. This boat has light draft, and is of such size as to be easily maneuvered in the Yazoo and its tributaries and has done good work in that river system.

It is believed that a snag boat, with steel hull somewhat larger than the *Columbia*, but designed on the same general lines, could attend to snagging operations in the Yazoo system, with the assistance of a chopping party quartered on a house boat, doing shore work, building wing dams, etc. It is respectfully recommended that such a boat be built, and that upon her completion the snag boats now on hand be transferred to other work or sold.

Following is an outline description of the boat required:

Hull.—Length, 135 feet; beam, 34 feet; depth, 4½ feet. Sheathing, bottom and sides, $\frac{5}{16}$-inch plates on frames of 3 by 3 inch angles; with deck sheathing of $\frac{3}{8}$-inch steel plates extending from bow back to middle of boiler. Two longitudinal and 4 cross bulkheads of $\frac{3}{16}$-inch steel plates and 3 by 3 inch angles.

Cabin.—One hundred feet long and 34 feet wide, including guards; with quarters for 18 laborers on lower deck between boilers and engine room; and having 6 staterooms—with hall between—kitchen, storeroom, pantry, laundry, and bathroom above. To be built of white pine, poplar, or cypress—all perfectly plain—with full-length skylights.

Boilers.—Two; 150 horsepower each, externally fired, with return flues.

Main engines.—Two; high pressure; cylinders 12 inches by 5 feet.

Capstan engines.—Three; double cylinders, each 6 by 12 inches.

Capstans.—Three, with iron barrels.

Shear legs to be Phoenix columns, 11 inches by 30 feet.

It is estimated that the boat could be built, with machinery and tackle, for $50,000.

Very respectfully, your obedient servant,

T. C. Thomas,
Assistant Engineer.

Lieut. Col. H. M. Adams,
Corps of Engineers.

V 7.

PRELIMINARY EXAMINATION OF BIG BLACK RIVER, MISSISSIPPI, FROM ITS MOUTH TO THE ILLINOIS CENTRAL RAILROAD BRIDGE.

[Printed in House Doc. No. 207, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated July 18, 1902, by Capt. Chas. L. Potter, Corps of Engineers, on preliminary examination of Big Black River, Mississippi, from its mouth to the Illinois Central Railroad bridge, made in pursuance of a requirement in the river and harbor act of June 13, 1902.

In the opinion of the district engineer, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, the locality is not worthy of improvement by the General Government, and the Board of Engineers for Rivers and Harbors, by which the report has been reviewed in accordance with sections 3 and 14 of the said act, expresses the opinion in indorsement of March 11, 1903, that the present and prospective commerce involved is so small as to render undesirable the improvement of this stream by the United States.

This opinion is concurred in by me.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. CHAS. L. POTTER, CORPS OF ENGINEERS.

United States Engineer Office,
Vicksburg, Miss., July 18, 1902.

General: I have the honor to submit the following report respecting "Big Black River [Mississippi], from mouth to the Illinois Central Railroad Bridge," a preliminary examination of which was required by section 14 of the river and harbor act of June 13, 1902, and assigned to me by Department letter of June 23, 1902.

Big Black River has its source in Webster County, Miss., flows in a general southwesterly direction, and enters the Mississippi River at Grand Gulf, 37 miles below Vicksburg, having a length estimated to be about 400 miles. The Alabama and Vicksburg Railway crosses the river upon a fixed bridge near Smiths station, 14 miles east of Vicksburg, and the stream below that bridge to its mouth forms the eastern and southern boundary of Warren County, separating it from Hinds and Claiborne counties. The Illinois Central Railroad crosses the river upon fixed bridges at three different points above the crossing of the Alabama and Vicksburg Railway.

Under a provision of the river and harbor act of March 3, 1881, an examination of the river was made that year by Major Benyaurd, the report of which was printed in Senate Executive Document No. 69, Forty-seventh Congress, first session, and reprinted in the Annual Report of the Chief of Engineers for 1882, pages 1565 to 1570. Cox Ferry, on the boundary of Hinds and Yazoo counties, about 130 miles above the mouth of the river, was considered the head of navigation, and estimates were made for two seasons' work, to secure a temporary improvement of navigation below Cox Ferry, at high stages, by removing snags, logs, and leaning timber, at a cost of $32,000.

Appropriations were made as follows:

By act of—	
July 5, 1884	$5,000
August 5, 1886	5,000
July 13, 1892	5,000
Total	15,000

The first appropriation was expended in 1884–85. The act of 1886 required that no part of the appropriation should be used until the State of Mississippi had caused the bridges below the Vicksburg and Meridan (now Alabama and Vicksburg) Railroad to be so constructed as not to obstruct navigation. This requirement was not fulfilled until 1892, but the river and harbor act of 1890 removed the restriction contained in the act of 1886; the project was modified to include only that part of the river below the Baldwin Ferry bridge, about 70 miles from the mouth; and the funds were spent for the removal of obstructions during the period of low water in 1891. The last appropriation was expended in 1894, when the chief obstructions to navigation between Baldwin Ferry and the mouth were destroyed, and that stretch of river was put in fair condition for navigation at stages high enough to permit boats to cross the bars. Beyond the rafting of some timber no commerce developed, and at the close of the fiscal year 1895 the work was dropped from the list of duties of this district.

Conditions have not changed in the seven years since. Practically there is no navigation or commerce in Big Black River, present or prospective. Once in a while, every three or four years, a small steamboat may make a short trip into the lower river to bring out a stave boat or raft of logs, but beyond that there appears to be no business to be developed.

In 1901 the people living along the river below the Alabama and Vicksburg Railway bridge claimed that their crops had been ruined by successive freshets for three years, and that the height of the backwater over their farms and the duration of floods were increased by jams of drift, caused by material which had been cut by private individuals into the stream above the railroad bridge and permitted to accumulate at various points in the channel below. They appealed to the boards of supervisors of Warren and Hinds counties for relief, and, upon application made to Major Casey, then in charge of this district, by the president of the Warren County supervisors and by the president of the Vicksburg Board of Trade, Assistant Engineer Walter H. Polk made an examination of the locality, and reported as follows:

UNITED STATES ENGINEER OFFICE,
Vicksburg, Miss., January 28, 1901.

Maj. THOS. L. CASEY,
Corps of Engineers, U. S. A.

MAJOR: I have the honor to submit a report upon the drift accumulations in Big Black River between the mouth of Markham Creek and Egypt Place, a distance of about 15 miles.

There are nine places where the accumulation extends clear across the stream, six above and three below the Baldwin Ferry bridge. The largest of these drifts is about 125 yards long, and the smallest, recently formed, about 20 yards in length; the others varying between these figures.

As far as could be ascertained, they are all surface or floating drifts and do not form any serious obstruction to the flow of water, and it is not thought that they materially increase the height of overflow.

These drifts are all caused by logs lodging against leaning willows, or willows growing well out into the channel of the stream, and it is likely that, unless these trees are removed, there will be a recurrence of the drift jams. It is probable that $1,000 would be a sufficient sum to release the jams, and a less amount would be needed to remove the leaning timber on this portion of the river.

The formation of jams in the Big Black is of frequent occurrence. A chopping party working from below Baldwin Ferry bridge to the mouth in 1894 removed 33 complete jams and 41 side or partial jams.

Very respectfully, your obedient servant,

WALTER H. POLK,
Assistant Engineer.

I am advised that the accumulations of drift referred to above have been removed, to a considerable extent, by private enterprise, with a view to protecting the lands from overflow.

I can find no reason for recommending that the work of improving Big Black River be resumed. In view of the very limited commerce to be benefited and the fact that there is no probability that it may increase, and as the cost of maintenance by removing obstructions added each year would be considerable, I am of the opinion that this stream is not worthy of further improvement by the United States.

Very respectfully, your obedient servant,

CHAS. L. POTTER,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, DIVISION ENGINEER.

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., July 19, 1902.

GENERAL: I have the honor to forward herewith report of Capt. Charles L. Potter, Corps of Engineers, upon preliminary examination of Big Black River, Mississippi, from mouth to the Illinois Central Railroad Bridge.

I concur in the opinion of Captain Potter that this stream is unworthy of further improvement by the United States.

Very respectfully, your obedient servant,

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer, Gulf Division.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 11, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps

of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Second indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., March 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer, the indorsement of the division engineer, and a letter from the secretary of the Vicksburg Board of Trade.

The Board is of the opinion that the present and prospective commerce involved is so small as to render undesirable the improvement of this stream by the United States.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

V 8.

PRELIMINARY EXAMINATION OF CYPRESS BAYOU, TEXAS, INCLUDING THE LAKES BETWEEN JEFFERSON, TEXAS, AND RED RIVER, LOUISIANA.

[Printed in House Doc. No. 115, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Wanhington, December 1, 1903.

Sir: I have the honor to submit herewith a report dated July 18, 1902, by Capt. Chas. L. Potter, Corps of Engineers, on preliminary examination of "Cypress Bayou, and especially Cypress Bayou with the lakes between the city of Jefferson, Tex., and the Red River, with view to ascertaining whether the same can be made navigable by means a dam put below Albany flats, and by cutting a ditch in a northeasterly of direction into Red River," made pursuant to a requirement in the river and harbor act of June 13, 1902.

Captain Potter stases that in his judgment water transportation between Shreveport and Jefferson can not be maintained by building a dam below Albany flats and by cutting a ditch in a northeasterly direction to Red River, unless there be added an expensive system of locks and dams, and it is his opinion, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, that the locality is not worthy of improvement by the United States.

Under the provisions of sections 3 and 14 of the above-mentioned act this report has been reviewed by the Board of Engineers for Rivers and Harbors, in whose opinion, as stated in its report of March 11, 1903, it is not desirable for the United States to undertake this improvement.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. CHAS. L. POTTER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Vicksburg, Miss., July 18, 1902.

GENERAL: I have the honor to submit the following report respecting "Cypress Bayou, and especially Cypress Bayou with the lakes between the city of Jefferson, Tex., and the Red River; with a view to ascertaining whether the same can be made navigable by means of a dam put below Albany flats, and by cutting a ditch in a northeasterly direction into Red River," a preliminary examination of which was required by section 14 of the river and harbor act of June 13, 1902, and assigned to me by Department letter dated June 23, 1902.

Cypress Bayou evidently was an unnavigable stream until the advance of the Red River raft above Shreveport, acting as a dam, forced the water into its bottom lands and converted them into reservoirs, known as Fairy, Sodo, and Cross lakes. The Bayou proper is a narrow stream about 23 miles long, but the water route from Jefferson to Red River, 65 miles in length, consists of four distinct divisions, viz: Cypress Bayou, Fairy Lake, Sodo Lake, and Twelvemile Bayou, the latter entering Red River about three-fourths of a mile above Shreveport. Albany flats are in Sodo Lake, about 16 miles by water from Shreveport.

Before a channel was cleared through the great Red River raft in 1873 there was some navigation in Red River above that obstruction at high stages by means of circuitous routes through the lakes and overflowed lands, and Lieutenant Woodruff reported, April 25, 1872, that—

> from Shreveport to the head of Willow Pass (the upper end of Sodo Lake) the route is identical with that of boats for the upper river. At this point boats for Jefferson turn to the west into Fairy Lake, and by a tolerably direct course in high water reach the present mouth of Cypress Bayou, west of the Texas line. [Annual Report of the Chief of Engineers for 1872, p. 572.]

Work on the part of the United States for improving navigation between Jefferson, Tex., and Shreveport, La., by the removal of stumps and sunken logs and by dredging at the narrow passes was begun under the river and harbor act of June 10, 1872, and the sum of $133,701.33 has been appropriated for the purpose. The removal of the Red River raft and the subsequent closure of outlets and construction of levees along the right bank of Red River caused the bottom of the river to scour and deepen, reduced the water supply of the lakes to their natural drainage, except in extreme floods, and made them drain more rapidly, shortening the period of navigation to Jefferson year by year, until there were rare stages at which boats could cross Albany flats.

On account of this condition the river and harbor act of September 19, 1890, made the following provision, viz:

> The Secretary of War is hereby directed to cause a survey to be made of Cypress Bayou and the lakes between Jefferson, Tex., and Shreveport, La., in order to ascertain if the navigation of the said bayou and lakes can be materially and permanently improved by the construction of such dams, and locks and dams, as may be necessary, and if found practicable the probable cost thereof.

This survey was made by Captain Willard, and the final report thereon is printed in the Annual Report of the Chief of Engineers for 1893, pages 2065 to 2082, to which reference is respectfully invited.

A plan was formulated in that report for the construction of a dam across Sodo Lake just above Albany flats and for an inlet from Red River through Cottonwood Bayou, with a lock at the head of the bayou 29¾ miles by river above Shreveport. This plan was a development of that proposed by Captain Howell (Annual Report of the Chief of Engineers for 1874, pp. 706 to 720), Cottonwood Bayou having been substituted for a dredged cut across to Gold Point, with a lock in place of an open channel.

Respecting the change from the original plan for a dredged cut from Albany flats to Gold Point on Red River, Captain Willard reported as follows:

> The survey has confirmed the truth of the statement in my last report (Report of the Chief of Engineers for 1892, p. 1670) that if the plan of 1874 had been carried out "the water from Red River would not now reach the zero of the Jefferson gauge at low water," and proves that the final result would have been the same whether the dam had been built under the first project, with "crest 14 feet below local high-water mark of 1866," under the second, with "crest 2 feet above high water of 1866 on Red River," or under the third, with a spill "9 feet below the high water of 1866" at the site of the dam. In other words, the dams would have caused greater or less overflow of the lake region in high water, but would have had no influence whatever upon extreme low water at Jefferson, except, perhaps, in delaying the date, depending upon the discharge section of the cut to Gold Point. Finally, presuming the cut to have been made stable, the current through it at certain differences of relative stage would have been too great for navigation into or from the lakes.
>
> Cottonwood Bayou is the first natural entrance to Red River above Shreveport by which a navigable route could be made to the lakes, in connection with a dam across them, with any hope of success or expectation of moderate length of usefulness. But the objections to an open route through the bayou are greater than for that proposed to Gold Point, both because the fall from Red River to the lake is considerably more and because all of the outlets above Cottonwood Bayou through which the lake region was filled during the raft period have been closed or will be closed within the next two years in carrying on the work of improving Red River and completing the levee system from Blanton Bluff downstream. Cottonwood Bayou itself, perhaps, might be closed also if only the question of improving Red River should be considered, either permanently by embankment on the levee line or by a weir and sluices if it should be found advisable to convert the lakes into reservoirs. Assuming, however, that Cottonwood Bayou is to form part of the navigable route to Jefferson, the water supply of "Cypress Bayou and the lakes" will be limited to the natural drainage of their basin with that which may be let in from Red River through Cottonwood Bayou or through sluices near by. A lock will be required with double sets of gates, since the head may change from lake to river, according to the rise and fall. The site of the dam across Sodo Lake is somewhat below the lower mouth of Cottonwood Bayou, the wasteweir being put at reference 60 meters above Cairo datum and the embankment extended along the highest ground below Cottonwood Bayou to a point at the same elevation as the weir crest, the object being to avoid impounding too great an amount of water, which would increase the area of overflow so much as to endanger the levee system above and the lands for the protection of which they were built. The elevation of 60 meters for the weir crest is more than needed for the present or prospective commerce of Jefferson, the lowest water at that point being not

less than 57, but seems to be required to reduce the fall from Red River through Cottonwood Bayou, which in extreme cases is now very near 5 meters. [Report of the Chief of Engineers for 1893, pp. 2066 and 2067.]

The cost of the work required was estimated to be $375,000; but Congress did not enter upon the project, presumably on account of the limited commerce to be benefited, the additional expenses of operation and maintenance after completion of the dam and lock, and the fact that the probable life of the improvement could not be estimated with any degree of accuracy.

The river and harbor act of August 18, 1894, enacted more than a year after Captain Willard's report was made, contained an appropriation of $10,000 "for dredging and removing obstructions and straightening channel between Jefferson, Tex., and Shreveport, La." This appeared to give reasonable assurance that the General Government had no intention of building a lock at the head of Cottonwood Bayou, and in 1896 that bayou was closed by a heavy earthen dam, built by the Caddo levee district commissioners, and forming a part of the permanent levee system along the right bank of Red River from the hills in Arkansas at Blanton Bluff and already built to Buckhall, La., 15 miles above Shreveport.

Jefferson is the only place of any importance on the 65-mile water course to Red River which forms a part of the boundary between Marion and Harrison counties in Texas and crosses Caddo Parish, La. Years ago there were about 20 small landings scattered along this route, few of which ever attained the distinction of a village, and most of which have now disappeared. According to the last four censuses, the populations of Jefferson, of the two counties in Texas, and of the Louisiana parish were as follows:

Towns, counties, and parish.	1870.	1880.	1890.	1900.
Jefferson	4,190	3,260	3,072	2,850
Marion County	8,562	10,983	10,862	10,754
Harrison County	13,241	25,177	26,721	31,878
Caddo Parish	21,714	26,296	31,555	44,499
Total	43,517	62,456	69,138	87,131

Marshall, Tex., is the county seat of Harrison County, and Shreveport, La., of Caddo Parish, the populations of both, and of Jefferson, the county seat of Marion County, being included in the above statement.

Sodo Lake now is crossed at Mooringsport, 21 miles from Shreveport, by the line of the Kansas City Southern Railway running from Kansas City, Mo., to Port Arthur, Tex., and Twelvemile Bayou is crossed by the Texarkana, Shreveport and Natchez Railway. Under authority of an act of Congress of February 8, 1901, and plans approved by the Secretary of War, February 14, 1901, the Shreveport Water Works Company has built a low dam across Twelvemile Bayou immediately below the point of departure of Blind Bayou (the elevation of crest of which does not exceed a stage of 10 feet upon the Shreveport gauge), with a wooden bridge or crossing surmounting and 5 feet above the dam. In conjunction with this dam the channel of Blind Bayou is being deepened and widened to accommodate the discharge of Twelvemile Bayou, the object of the whole work being to transfer the outlet of Twelvemile Bayou from Old River to Cross Bayou, free from the influence of Red River at stages lower than the crest of the dam.

There have been no very high stages of Red River since April, 1897, when the Shreveport gauge registered 24.1 feet (11.6 feet below extreme high water of May 28, 1892), and there has been no commerce reported in Cypress Bayou and the lakes since the fiscal year 1897, given upon page 1898 of the Report of the Chief of Engineers for 1897. The maintenance of navigation between Shreveport and Jefferson doubtless would act as a check upon freight rates, but there is no assurance that the waterway would be used to any great extent as a transportation route, and the benefits that might be derived from its improvement are largely conjectural.

The plea for the work is contained in the copy of correspondence[a] with the Jefferson Commercial Club, taken from Major Willard's report of 1897 (Annual Report, Chief of Engineers, 1897, pp. 1899 to 1904) and appended hereto.

As the law calls for my opinion as to the advisability of the improvement, I have to state that in my judgment water transportation between Shreveport and Jefferson can not be maintained by building a dam below Albany Flats and by cutting a ditch in a northeasterly direction to Red River unless there be added an expensive system of locks and dams, upon which half a million dollars or more might be spent with small return of business. It is my opinion, therefore, that Cypress Bayou and the lakes are not worthy of further improvement by the United States.

Very respectfully, your obedient servant,

Chas. L. Potter,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, DIVISION ENGINEER.

Office Division Engineer, Gulf Division,
New Orleans, La., July 19, 1902.

General: I have the honor to forward herewith report of Capt. Charles L. Potter, Corps of Engineers, upon preliminary examination of Cypress Bayou, Texas, and the lakes between the city of Jefferson, Tex., and the Red River, etc.

I concur in the opinion expressed by Captain Potter that Cypress Bayou and the lakes between Jefferson, Tex., and the Red River are unworthy of further improvement by the United States.

Very respectfully, your obedient servant,

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer, Gulf Division.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

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[a] Not printed.

[First indorsement.]

Office Chief of Engineers, U. S. Army,
August 11, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Second indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., March 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given full consideration to the accompanying report of the district officer, the report of the division engineer, a number of letters and petitions from interested persons, and has, through a committee, made a personal inspection of the locality.

The relative elevations of low water at Jefferson, Tex., and in Red River in a northeasterly direction from Albany flats, are such as to induce the Board to believe that no material benefit would result from the work contemplated in the act of June 13, 1902, viz, a dam put below Albany flats and a ditch in a northeasterly direction into Red River. Much additional work would be necessary to accomplish the desired end of giving a navigable depth at low water to Jefferson; to assure ultimate permanent success, this work would necessarily be extensive and costly. When consideration is given to the inevitable claims for damages to land overflowed by the pool of the dam, it appears that the total expense would be very great, and, in the opinion of the Board, out of all proportion to the probable benefits.

The Board therefore believes that it is not desirable for the United States to undertake this improvement.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

V 9.

PRELIMINARY EXAMINATION OF RED RIVER FROM FULTON, ARKANSAS, TO DENISON, TEXAS.

[Printed in House Doc. No. 200, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith for transmission to Congress copy of report dated July 18, 1902, by Capt. Chas. L. Potter, Corps of Engineers, on preliminary examination of Red River from

Fulton, Ark., to Denison, Tex., to determine whether the river can be made navigable by the removal of obstructions to navigation, and the cost thereof, made in pursuance of a requirement in the river and harbor act approved June 13, 1902.

This section of the Red River is about 292 miles in length, of which about 190 miles, from Fulton to mouth of Kiamichi River, is covered by an existing project for improvement by snagging operations, etc. There is no navigation above the mouth of the Kiamichi, the proposed extension of work to Denison having for its object the reduction of railway freight rates.

Captain Potter is of opinion, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, that this part of Red River is not worthy of improvement by the General Government beyond the limits and method authorized in the present project.

Under the provisions of section 14 of the above-mentioned act the Board of Engineers for Rivers and Harbors, authorized by section 3 of said act, has reviewed this report, having held a public hearing at Denison, and its report is made in second indorsement thereon. In the opinion of the Board none but a radical improvement of the stretch of the river under consideration would be of appreciable benefit to navigation, and the cost of such measures would be plainly out of proportion to the direct benefits, while the indirect benefits accruing to general commerce through the consequent reduction of railroad freight rates may be expected to follow the improvement of Trinity River should this be carried out. In view of this the Board believes that it is not desirable at present for the United States to undertake the improvement of Red River from Fulton, Ark., to Denison, Tex., and in this conclusion I concur.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. CHAS. L. POTTER, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Vicksburg, Miss., July 18, 1902.

GENERAL: I have the honor to submit the following report of preliminary examination of "Red River, from Fulton, Ark., to Denison, Tex., to determine whether the river can be made navigable by the removal of obstructions to navigation, and the cost thereof," required by section 14 of the river and harbor act approved June 13, 1902.

Four examinations of this stretch of Red River have been made: By Captain Benyaurd in 1878 (Annual Report, Chief of Engineers, 1879, p. 986); by Captain Taber in 1884 (Annual Report, Chief of Engineers, 1885, Part 2, pp. 1617 and 1623); by Major Willard in 1899 (Annual Report, Chief of Engineers, 1900, p. 2565); and by Major Casey in 1900 (Annual Report, Chief of Engineers, 1901, p. 2073), reference to which is respectfully invited.

The present project for the improvement of Red River contemplates snagging operations, etc., above Fulton, Ark., to the mouth of Kiamichi River, Indian Territory, and none of the reports of examinations has been favorable to an extension of work above the latter point. The last two reports are of such recent date that a reexamination is not considered necessary.

The distance from the mouth of Kiamichi River to the Missouri, Kansas and Texas Railway bridge north of Denison, Tex., is estimated to be about 122 miles. In this stretch the river is wide, shallow, and comparatively straight, the bends being long and of slight curvature. The obstructions consist of constantly shifting sand bars, snags, drift piles, heavy growths of timber upon unstable banks, and rock shoals at three localities. Any form of improvement that might be attempted would be expensive and of a temporary character, and its cost can not be approximated without a survey. The settlements along the river are few, and the land under cultivation is but a small proportion of the whole.

At high stages Red River above Fulton, Ark., is navigable for small boats. Lanesport, Ark., near the Indian Territory line, about 74 miles from Fulton, is considered the head of navigation; but boats have made occasional trips to the mouth of the Kiamichi. Navigation—always sporadic—practically ceased some years ago and has not revived. The commercial bodies of Paris and Denison, Tex., desire a renewal of work for the improvement of the river, and for its extension upstream, with a view to securing a reduction of freight rates. If the amount of business to be developed were sufficient to make it profitable for steamboats to enter the trade and remain permanently, a reduction of railway rates to competitive points might result; but it does not appear that the prospective commerce is of such magnitude as to warrant a large expenditure for an improvement and annual charges for its maintenance, and I am constrained to the opinion that this part of Red River is not worthy of improvement by the General Government beyond the limits and method authorized in the present project.

Very respectfully, your obedient servant,

CHAS. L. POTTER,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, DIVISION ENGINEER.

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., July 19, 1902.

GENERAL: I have the honor to forward herewith report of Capt. Chas. L. Potter, Corps of Engineers, upon preliminary examination of Red River from Fulton, Ark., to Denison, Tex., to determine whether the river can be made navigable by the removal of obstructions, etc.

I concur in the opinion expressed by Captain Potter that this part of Red River is not worthy of improvement by the United States beyond the limits and methods authorized in the present project.

Very respectfully, your obedient servant,

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer, Gulf Division.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

[First indorsement.]

Office Chief of Engineers, U. S. Army,
August 11, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Second indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., April 28, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has carefully considered the * * * report of the district officer upon a preliminary examination of "Red River, from Fulton, Ark., to Denison, Tex.," * * * the report of the division engineer, and statements and data presented by interested parties. A committee of the Board visited Denison, Tex., and held a public hearing there on December 15, 1902.

Red River is under improvement by the United States from its mouth to the mouth of Kiamichi River, a point about 122 miles below Denison, Tex. The project for the upper 170 miles of this improvement, from Fulton, Ark., to the mouth of Kiamichi, contemplates snagging operations only. At present there is practically no commerce on the section of river from Fulton to the mouth of Kiamichi, and none on the section from Kiamichi to Denison.

The improvement desired by interested parties is the extension of snagging operations to the section between the Kiamichi and Denison. Those interested believe that the improvement would result in a small amount of river commerce, but a considerable reduction in freight rates over a large area of productive territory in north Texas, Oklahoma, and Indian Territory.

Both artificial and natural conditions combine to sustain exceptionally high freight rates from the area mentioned to the seaboard and hence to eastern and foreign markets. No available water route now penetrates this section, and none approaches nearer than Red River in Arkansas and Louisiana, and Arkansas River in Arkansas. At present, rates between the seaboard and north Texas are generally higher than between the seaboard and Kansas, even though the latter rates apply to shipments passing through north Texas. It is the policy of the railroad commission of the State of Texas to preserve equal freight rates to and from all jobbing centers in northern Texas. Hence, points in northeastern Texas receive but little if any benefit from the water rates at Shreveport, La., and Fulton, Ark.

The act of June 13, 1902, tentatively adopted a project for the improvement of Trinity River, designed to create a water route from Dallas, Tex., to the port of Galveston. Dallas is in north Texas, within the area that would presumably be benefited by an improvement of Red River, and is but 73 miles distant from Denison.

Red River between Denison, Tex., and Fulton, Ark., is not only obstructed by snags, fallen trees, etc., but in many places by shoals of shifting sand and gravel where there are less than 3-foot depths and where the channel is undefined. At Arthur City, Tex., a short distance above the mouth of the Kiamichi, there is a fixed railroad bridge, which prevents boats of moderate size from passing at any stage of water.

In the opinion of the Board none but a radical improvement of the stretch of river under consideration would be of appreciable benefit to navigation. The cost of such improvement can not be estimated without a survey, but from experience elsewhere it would plainly be out of proportion to the direct benefits to navigation, while the indirect benefits accruing to general commerce through the consequent reduction of railroad freight rates may be expected to follow the improvement of the Trinity River, should this be carried out.

In view of the foregoing the Board is constrained to believe that it is not desirable at present for the United States to undertake the improvement of Red River from Fulton, Ark., to Denison, Tex.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

V 10.

PRELIMINARY EXAMINATION OF SULPHUR RIVER, TEXAS, FROM ITS MOUTH TO SULPHUR STATION.

[Printed in House Doc.No. 231, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith copy of a report dated July 18, 1902, by Capt. Charles L. Potter, Corps of Engineers, on preliminary examination of Sulphur River, Texas, from its mouth to Sulphur station, with a view to ascertaining the best and most advisable method to procure a navigable depth of 4, 5, and 6 feet, made in pursuance of a requirement of the river and harbor act of June 13, 1902.

Captain Potter states that practically there is no navigation on Sulphur River at the present time; that the stream appears to have no prospective commercial importance in the near future, and that in his opinion its improvement by the United States would result in no public benefit and is not advisable. In this opinion the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, concurs and states that in his opinion the locality is not worthy of improvement by the General Government.

This report has been reviewed by the Board of Engineers for Rivers and Harbors in accordance with provisions of sections 3 and 14 of the above-mentioned act, and in the Board's report of April 15, 1903, the opinion is expressed that it is not advisable for the United States to resume the improvement of this stream.

I concur in the opinion of the Board.

The sum of $2,488.99 was expended in 1896 and 1897 on improvement of Sulphur River by snagging operations.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. CHAS. L. POTTER, CORPS OF ENGINEERS.

United States Engineer Office,
Vicksburg, Miss., July 18, 1902.

General: I have the honor to submit the following report of a preliminary examination of the Sulphur River, Texas, "from its mouth to Sulphur station, with a view to ascertaining the best and most advisible method to procure a navigable depth of 4, 5, and 6 feet," required by section 14 of the river and harbor act approved June 13, 1902.

Two examinations of this stream have been made: By Captain Miller in 1882 (Annual Report, Chief of Engineers, 1884, p. 1345) and by Captain Williard in 1893 (Annual Report, Chief of Engineers, 1893, p. 2083). Captain Miller's report was unfavorable to any improvement. Captain Williard considered the stretch of river below Sulphur station, Tex., about 50 miles, as worthy of improvement, to the extent of removing snags and logs in the channel and cutting overhanging timber obstructing navigation, with perhaps a small amount of dredging.

The river and harbor act of August 18, 1894, in the item for improving Red River, Louisiana and Arkansas, from Fulton, Ark., to the Atchafalaya River, provided an allotment from that appropriation of "5,000 for improving the Sulphur River, a tributary of the Red River." Of this allotment the sum of $2,488.99 was expended for snagging operations, etc., the work having been performed in 1896 and 1897. (See Annual Reports of the Chief of Engineers for 1896, p. 1581, and for 1897, p. 1889.) October 15, 1901, Major Casey, in response to Department circular letter of October 12, 1901, suggested that the unexpended balance of this allotment ($2,511.01) be transferred to the fund for the general improvement of Red River, and this transfer was directed by the river and harbor act of June 13, 1902.

The Texas and Pacific Railway crosses Sulphur River at Sulphur station, Tex., on a long trestle, with a small section over the channel that can be removed for the passage of tugs. The Kansas City Southern Railway crosses the river a short distance below, near the Arkansas line, and the Texarkana, Shreveport and Natchez, a division of the Texas and Pacific Railway, crosses near Fort Lynn, Ark., a short distance above the mouth. The last two bridges were authorized by Congress, and, under plans approved by the Secretary of War March 25, 1901, the Kansas City Southern Railway Company was authorized to substitute for its former trestle bridge a steel fixed span of 230 feet mounted on masonry, at an elevation of about 25 feet above low water, with a trestle at the north end sufficient to pass overflow water. It developed at the time this change was under consideration, in February, 1901, that no commercial boats had been up Sulphur River to the Kansas City Southern Railway bridge for about nine years, and that no river business of any importance had been transacted for a much longer period. The towing of rafts of logs to local sawmills is the only business that has been transacted in the last twenty years, the products of the mills having been shipped by rail.

Assistant Engineer John Ewens, who made the examination under direction of Captain Willard in 1893, reported that—

> The oldest and best informed steamboat and lumber men met with informed me that Sulphur River always has been navigable for not less than ten months each year as far back as they could remember (1856). I was also informed that Sulphur River always is navigable when steamboats can come up Red River from Shreveport to its mouth. [Annual Report, Chief of Engineers, 1893, p. 2085.]

The work performed in 1896–97 for the removal of snags and leaning timber put the stream in fair navigable condition (Report Chief of Engineers, 1897, p. 1889), but resulted in no increase of business, as not a single steamboat from Red River entered the tributary stream. The city of Texarkana, Tex. and Ark., is less than ten miles distant from the crossing of the Kansas City Southern Railway, but past experience does not justify the belief that there will be any extensive shipments to or from that city by the water route, which now is available for navigation whenever Red River steamboats can run above Shreveport to its mouth.

Practically there is no navigation at the present time; the stream appears to have no prospective commercial importance in the near future, and for these reasons it is my opinion that its improvement by the United States would result in no public benefit, and is not advisable.

Very respectfully, your obedient servant,

Chas. L. Potter,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, DIVISION ENGINEER.

Office Division Engineer, Gulf Division,
New Orleans, La., July 19, 1902.

General: I have the honor to forward herewith report of Capt. Chas. L. Potter, Corps of Engineers, upon preliminary examination of the Sulphur River from its mouth to Sulphur station, Tex., with a view to ascertaining the best and most advisable method to procure a navigable depth of 4, 5, and 6 feet.

I concur in the opinion expressed by Captain Potter that the improvement of this stream by the United States is not advisable.

In my opinion it is unworthy of improvement by the General Government.

Very respectfully, your obedient servant,

H. M. Adams,
Lieut. Col., Corps of Engineers,
Division Engineer, Gulf Division.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

[First indorsement.]

Office Chief of Engineers, U. S. Army,
August 11, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Second indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., April 15, 1903.

Respectfully returned to the Chief of Engineers, United States Army. The Board of Engineers for Rivers and Harbors has carefully considered the accompanying report of the district officer on a preliminary examination of "the Sulphur River [Texas] from its mouth to Sulphur station, with a view to ascertaining the best and most advisable method to procure a navigable depth of 4, 5, and 6 feet," the indorsement of the division engineer, and other data at hand.

The river and harbor act of August 18, 1894, in an item for improving Red River, Louisiana and Arkansas, allotted $5,000 for the improvement of its tributary, Sulphur River. Of this sum, $2,488.99 was expended in snagging operations, which put the stream in fair navigable condition, but resulted in the development of no river traffic. The river and harbor act approved June 13, 1902, transferred the balance of this allotment to the general fund for improving Red River, as recommended by the district officer.

Investigation made in February, 1901, developed the fact that no commercial boats had been up Sulphur River as far as the Kansas City Southern Railroad bridge, near the Texas and Arkansas boundary line, for about nine years, and that no river business of any importance had been transacted for a much longer period. It appears, moreover, that the condition of Sulphur River has generally been such that navigation was possible thereon whenever steamboats could come up to its mouth from Shreveport.

In view of the absence of commerce now, the improbability of its development if the stream were further improved, and the fact that navigation is already equally practicable in the lower Sulphur and in Red River, into which it flows, it is the opinion of the Board that it is not advisable for the United States to resume the improvement of this stream. The best and most advisable method to procure a navigable depth of 4, 5, and 6 feet can not be ascertained without a survey and estimate of cost, which is not recommended.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

V II.

PRELIMINARY EXAMINATION OF TALLAHATCHIE RIVER, MISSISSIPPI, FROM MOUTH OF COLDWATER RIVER TO BATESVILLE.

[Printed in House Doc. No. 190, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated July 18, 1902, by Capt. Chas. L. Potter, Corps of Engineers, on preliminary examination of Tallahatchie River, Mississippi, from mouth of Coldwater River to Batesville, made pursuant to a requirement in the river and harbor act of June 13, 1902.

The sum of $10,000 has heretofore been expended on improvement of this section of the river, but the improvement not being deemed advantageous in a commercial view, work was discontinued in 1882.

In the opinion of Captain Potter, concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, the locality is not now worthy of improvement by the General Government, and the Board of Engineers for Rivers and Harbors, which has reviewed this report in accordance with provisions of sections 3 and 14 of the above-mentioned act, states in its report of March 11, 1903, that it is not desirable for the United States to resume this work.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

RRPORT OF CAPT. CHAS. L. POTTER, CORPS OF ENGINEERS.

United States Engineer Office,
Vicksburg, Miss., July 18, 1902.

General: I have the honor to submit the following report respecting "Tallahatchie River [Mississippi], from mouth of Coldwater River to Batesville," a preliminary examination of which was required by section 14 of the river and harbor act of June 13, 1902, and assigned to me by Department letter of June 23, 1902.

Captain Benyaurd made an examination of Tallahatchie River in 1878 and recommended two seasons' work for the removal of snags, logs, wrecks, etc., obstructing navigation below the mouth of Coldwater River, estimating the cost at $40,000. He stated that—

> The upper section, before joining the Coldwater, is not considered as in any navigable condition. It is crossed by two lines of railroad—the Mississippi Central and Mississippi and Tennessee—which supply and transport all freight for the section of the country through which the stream passes. It is necessary, therefore, to consider only the main river, which, with the Coldwater, may be regarded as one stream. [Report, Chief of Engineers, 1879, page 985.]

The river and harbor acts of 1880, 1881, and 1882, however, required the expenditure of $10,000 above the mouth of the Coldwater to Batesville, and when operations were suspended in 1882 Major Benyaurd reported as follows:

> On the stretch of river between Batesville and the mouth of the Coldwater I do not think it advantageous, in a commercial view, to expend any more money. There has not been a boat on this section of the river since the war. I doubt, even if the river was improved, that boats could be induced to run. [Report, Chief of Engineers, 1882, page 1551.]

Work above the mouth of Coldwater River has not been resumed since. The river and harbor act of July 13, 1892, appropriated $5,000 for continuing the improvement of Tallahatchie River, with a provision that "two thousand dollars may be used in the improvement of said river between the bridge at Panola, Mississippi, and the mouth of the Coldwater River, at the discretion of the Secretary of War," but, upon recommendation of the Chief of Engineers, the Secretary of War authorized the entire appropriation to be expended on the river below the mouth of Coldwater River.

Batesville, Miss., is a station upon a branch of the Illinois Central Railroad, running from Grenada, Miss., to Memphis, Tenn. It is the county seat of Panola County, and is a short distance back from the river, the nearest landing being at Panola. Below Panola to the mouth of Coldwater the Tallahatchie River traverses parts of two counties, Panola and Quitman. The removal of snags, logs, and leaning trees might make it navigable for a very limited period of the year, but there is no steamboat trade now and no probability that any would be developed by such improvement. It is said that once in a great while, at very irregular intervals, when the stage is highest, a towboat will go above the mouth of the Coldwater River for a distance of 10 or 15 miles to bring out staves, but as a rule the Tallahatchie River packets do not extend their trips above Sharkey Landing, some 35 miles or more below the mouth of the Coldwater.

For the reasons reviewed in this report, I am of the opinion that Tallahatchie River above the mouth of Coldwater River is not worthy of improvement by the United States.

Very respectfully, your obedient servant,

Chas. L. Potter,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, DIVISION ENGINEER.

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., July 19, 1902.

GENERAL: I have the honor to forward herewith report of Capt. Charles L. Potter, Corps of Engineers, upon preliminary examination of Tallahatchie River, Mississippi, from mouth of Coldwater River to Batesville.

I concur in the opinion expressed by Captain Potter that this stream, above the mouth of Coldwater River, is unworthy of improvement by the United States.

Very respectfully, your obedient servant,

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer, Gulf Division.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 11, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the accompanying report of the district officer and the report of the division engineer.

From 1880 to 1882, $10,000 was appropriated for the improvement of this section. The expenditure of this amount was followed by no commercial use of the river. The present and prospective commerce involved is small, and in the opinion of the Board is insufficient to warrant any work of improvement.

The Board therefore believes that it is not desirable for the United States to resume this work.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

V 12.

PRELIMINARY EXAMINATION OF YALOBUSHA RIVER, MISSISSIPPI, FROM GRENADA TO ITS MOUTH.

[Printed in House Doc. No. 201, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated July 18, 1902, by Capt. Charles L. Potter, Corps of Engineers, on preliminary examination of Yalobusha River, Mississippi, from Grenada to its mouth, ordered by the river and harbor act approved June 13, 1902.

Operations for the improvement of this stream have heretofore been carried on by the United States, but were discontinued because of the lack of sufficient commerce to justify further operations, and Captain Potter states that he is unable to find any change of conditions that would justify an appropriation for resuming work. He expresses the opinion, which is concurred in by the division engineer, Lieut. Col. H. M. Adams, Corps of Engineers, that the locality is not worthy of improvement by the General Government.

This report has been reviewed by the Board of Engineers for Rivers and Harbors, under the provisions of sections 3 and 14 of the abovementioned act, and, for reasons stated in its report of March 11, 1903, the Board is of opinion that it is not desirable for the United States to resume the improvement of this river.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. CHAS. L. POTTER, CORPS OF ENGINEERS.

United States Engineer Office,
Vicksburg, Miss., July 18, 1902.

General: I have the honor to submit the following report respecting Yalobusha River, Mississippi, from Grenada to its mouth, a preliminary examination of which was required by section 14 of the river and harbor act of June 13, 1902, and assigned to me by Department letter dated June 23, 1902.

A report upon this stream was made by Captain Willard February 23, 1895 (printed in H. Ex. Doc. No. 351, 53d Cong., 3d sess., and reprinted in the Report of the Chief of Engineers for 1895, pp. 1979 to 1984), * * * to which reference is respectfully invited. In view of the information contained in this report it was not considered necessary to incur the expense of making a reexamination.

The Yalobusha River below Grenada is a tortuous stream, estimated to be about 63 miles in length. The distance by wagon road from

Grenada to Greenwood, 3 miles below its mouth, is said to be about 34 miles. From Grenada its course is in a southwesterly direction through the western half of Grenada County; thence southerly, forming the boundary between the northeastern part of Leflore County and northwestern part of Carroll County; and thence southwesterly, for a few miles in Leflore County, to its confluence with Tallahatchie River at the head of Yazoo River. Grenada is the only town upon the river, and limited areas in the three counties mentioned above are the only districts that possibly might be benefited by an improvement of navigation.

The following tabulation, furnished by the Census Office, shows the population of Grenada and of the entire three counties, according to the last four censuses:

Town and counties.	1870.	1880.	1890.	1900.
Grenada town	1,887	1,914	2,416	2,568
Grenada County	10,571	12,071	14,974	14,112
Carroll County	21,047	17,795	18,773	22,116
Leflore County	(*a*)	10,246	16,869	23,834
Total	31,618	40,112	50,616	60,062

a Organized from parts of Carroll and Sunflower counties between 1870 and 1880.

Grenada is on the main line of the Illinois Central Railroad from Chicago to New Orleans, and a branch of the same road extends northwesterly from Grenada to Memphis. The lower part of Yalobusha River is paralleled by the Yazoo branch of the Yazoo and Mississippi Valley Railroad from Grenada to Greenwood, 32.88 miles, and is crossed near its mouth by the Tallahatchie branch of the same road, running from Greenwood to Clarksdale on the main line from Memphis to New Orleans.

Before the Mississippi River levee system in this State was completed, upper Yazoo River and tributary streams were subject to frequent floods, and the stages were much higher and the period of high water of much longer duration than now. There was no railroad near Yalobusha River below Grenada, and the river and the wagon road were the only routes for transportation. At that time Yazoo River steamboats made occasional runs up the Yalobusha, sometimes going as high as Grenada, though the amount of trade never was sufficient to warrant regular trips. This business dwindled, however, until navigation practically ceased about sixteen years ago, and it has not been resumed.

No work for the improvement of the river has been done by the United States since 1887. The removal from the channel of the snags, logs, etc., which have accumulated in the interval of fifteen years, and the clearing of the heavy growth of timber along the banks would not afford a permanent improvement, and appropriations for maintenance would be necessary from year to year. Such work might permit navigation of small boats at high stages, during a limited period of the year, but the boats could not risk trips to Grenada unless there was a reasonable probability of continued high water, which seldom occurs. To assure navigation between Grenada and the mouth would require some system of slack-water improvement, which would be planned from a survey, but the cost of such improvement would be out of all proportion to the commerce to be developed.

Several steamboat men, familiar with the Yalobusha River, have been questioned respecting the present and prospective needs of commerce, and they agree that, with the exception of an occasional boatload of staves, etc., there is no commerce now, and that there is none to be developed at present. The president of the principal steamboat line now operating in Yazoo River and its tributaries, in response to a letter from this office asking for statistics, stated that—

> There is not enough traffic in the Yalobusha River to justify any work. Traffic there would not support a catfish.

Under instructions from the Engineer Department, efforts were made early in the year 1901 to collect statistics and information respecting Yalobusha River, and a letter upon the subject was sent January 25, 1901, to the mayor of Grenada. As no reply has been received, it seems reasonable to infer that the town of Grenada feels no interest in the matter.

Captain Willard reported in 1895 that—

> The original project for improving Yalobusha River contemplated the removal of obstructions to afford safe navigation for small boats at high stages, or about four months of the year, in order to reduce freight rates on cotton and save to the planters the expense of the long haul to Grenada. This project was carried out by the expenditure of the amount of the original estimate, $7,000, and an additional expenditure of $4,000 for maintenance, but no business developed to justify further appropriations, and the improvement was dropped. In the interval of eight years which has elapsed since operations were suspended the results of all former work probably have been lost, and in view of the increased facilities for transportation by rail, it is doubtful if steamboat traffic would be revived if the river were cleared of obstructions and safe navigation maintained by work from year to year, as the navigable season necessarily would be short, and on account of its uncertainty the planters would market their crops and ship their supplies during fine weather when the stream is low, but the roads good.
>
> For the facts and reasons stated herein, I am constrained to the opinion that Yalobusha River is not worthy of further improvement by the United States.

This opinion was concurred in by the division engineer and by the Chief of Engineers, and I am unable to find any change of conditions in the seven years since or any argument that would justify an appropriation for resuming work in Yalobusha River, which, in my opinion, is not worthy of improvement by the General Government.

Very respectfully, your obedient servant,

CHAS. L. POTTER,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

REPORT OF LIEUT. COL. H. M. ADAMS, CORPS OF ENGINEERS, DIVISION ENGINEER.

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., July 19, 1902.

GENERAL: I have the honor to forward herewith report of Capt. Chas. L. Potter, Corps of Engineers, upon the preliminary examination of Yalobusha River, Mississippi, from Grenada to its mouth.

I concur in the opinion expressed by Captain Potter that this stream is not worthy of further improvement by the United States.

Very respectfully, your obedient servant,

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer, Gulf Division.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 11, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 11, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer, the indorsement of the division engineer, and a letter from the mayor of Grenada, Miss., in behalf of interested citizens of that community.

During the period 1881–1886, $11,000 was appropriated and expended by the United States in improving this stream. This improvement resulted in no increase in commerce; on the contrary, the little steamboat trade that was carried on prior to this period dwindled away and finally ceased about the last year of the improvement.

Having in mind both the present and reasonably prospective commerce involved, the Board believes that it is not desirable for the United States to resume the improvement of this river.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

APPENDIX W.

IMPROVEMENT OF ARKANSAS RIVER AND OF CERTAIN RIVERS IN ARKANSAS AND MISSOURI.

REPORT OF MAJ. GRAHAM D. FITCH, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Arkansas River, Arkansas.
2. White River, Arkansas.
3. Upper White River, Arkansas.
4. Operating and care of Lock and Dam No. 1, Upper White River, Arkansas.
5. Cache River, Arkansas.
6. Black River, Arkansas and Missouri.
7. Current River, Arkansas and Missouri.
8. St. Francis and L'Anguille rivers, Arkansas.
9. St. Francis River, Missouri.

EXAMINATION AND SURVEY.

10. Little Red River, Arkansas.

Engineer Office, U. S. Army,
Little Rock, Ark., July 8, 1904.

General: I have the honor to forward herewith annual reports for the fiscal year 1904 of the following-named works of river and harbor improvements under my charge. * * *

Very respectfully, your obedient servant,

Graham D. Fitch,
Major, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

W 1.

IMPROVEMENT OF ARKANSAS RIVER, ARKANSAS.

Operations this fiscal year.—Operations were confined mainly to the operation and care of snag boats, the only other work done having been that of the completion of repairs to Red Fork Revetment by contractors Hunter and Frey.

Snagging operations.—The snag boats *C. B. Reese* and *Arkansas* were in commission at the beginning of the year, the *C. B. Reese* being at work below Pine Bluff and the *Arkansas* at work between Pine Bluff and Little Rock. As the river between Poverty Point (8) and Pendleton (42) had become nearly impassable, both boats were sent to that section of the river early in the fiscal year, the *Arkansas* going to Saw Mill Bend (16) July 21 and the *C. B. Reese* to Poverty Point (8) July 27. The *C. B. Reese* worked between Poverty Point and Pendleton until August 15, upon which date the boat was transferred to White River. The *Arkansas* continued to work between Saw Mill Bend (16) and Pine Bluff (107) until November 15, when it began working from Pine Bluff to Little Rock (174), with the expectancy that Little Rock could be reached before low water would cause a suspension of operations. The boat worked up as far as Chenault bar (161), but could not get over this crossing on account of too small depth in the channel. It dropped back to Fourche Place, some 2 miles, November 29, and laid up for a rise in the river, only enough men being kept on the boat to take it to Little Rock, when the rise should come. The boat lay at Fourche Place until December 27, on which date it was run to Little Rock and placed in ordinary.

On June 7, 1904, the Secretary of War allotted from the emergency river and harbor act of April 28, 1904, $20,000 to this river. As soon as notification was received that this allotment had been made the work of preparing the *C. B. Reese* and the *Arkansas* for active operations was begun, and both boats will be ready for work at the beginning of the new fiscal year.

Summary of work accomplished.

Date.	Snag boat.	Work done between—	Distance.	Snags removed.	Trees cut.	Drifts broken.	Miles run.
1903.			*Miles.*				
July	Arkansas	Pine Bluff and Eagle Bend	46	85	747	2	200
	do	Sawmill Bend and Medford	13	70	....	....	130
Do	C. B. Reese	Poverty Point and Pine Bluff	99	182	1,074	1	223
August	Arkansas	Medford Bend and Corrinne	68	178	....	3	99
Do	C. B. Reese	Poverty Point and Pendleton	34	112	719	....	73
September	Arkansas	Homestead Bend and Ste. Maries.	62	220	....	....	108
October	do	Poverty Point and Douglass	53	165	1,217	....	208
November	do	Bickers Bend and Chenault bar.	105	158	1,338	....	114
Total		Poverty Point and Chenault bar.	145	1,170	5,095	6	1,155

Repair to Red Fork revetment.—The repair work here was interrupted in fiscal year 1903 by high water, and it was not until July 22 of this fiscal year that work could be resumed. The contractor then completed the contract by placing one subaqueous mattress, 98 by 100 feet, and by grading and riprapping 703 linear feet of bank. The small mattress placed this year is practically a continuation of the larger mattress placed before high water interrupted the work, and makes the completed work become 674 linear feet of mattress (100 feet wide) placed, and 1,003 linear feet of bank graded and riprapped, 468 cords of brush, and 2,255 cubic yards of stone being used in the entire work.

Memorandum regarding high water.—Above Little Rock the high water of this year exceeded that of 1892, but was below that of 1898; below Little Rock the conditions were reversed, the high water of this year exceeding that of 1898, but not reaching that of 1892; while in the vicinity of Little Rock the waters of the three years were about the same. The gauge readings and dates of maximum stages at the three places for those years are:

Fort Smith, May 19, 1892, 30.9 feet; May 7, 1898, 35.4 feet; June 7, 1904, 33.3 feet.
Little Rock, May 20, 1892, 28.2 feet; May 11, 1898, 27.5 feet; June 12, 1904, 27.8 feet.
Pine Bluff, May 22, 1892, 29.6 feet; June 13, 1904, 28.6 feet.

Such floods as these always leave the river with no well-defined channel on the numerous crossings, but as the river had only fallen to 17.5 on the Little Rock gauge at the close of the year no definite statement regarding the condition of the channel can be made at this time.

Recommendations for future operations.—The river and harbor act of June 13, 1902, authorized the Secretary of War to procure a suitable dredge boat or boats for use in this river. Of the $110,000 appropriated in that act for this river, $49,530 is available for application on a hydraulic dredge. For the reasons given in my last annual report, page 1410, it is thought to be unadvisable to purchase a dredge for this work until some experimental dredging has been done in the stream. The Mississippi River dredges are of a type suited for this work, and if one of them can give satisfactory results in the Arkansas River it might then be worth while to build dredges especially for this stream. Effort was made to borrow a dredge from the Mississippi River Commission, but none could be spared from the work on the Mississippi River. If conditions during the coming low water season are such that the Commission can spare a dredge, application will again be made for one, and until something definite is learned as to what results can be produced by one of those dredges, it is recommended that no further appropriations be made, especially for dredging. The snagging operations, while the benefits are temporary, appear to give more relief and benefit to navigation than any of the several schemes for improvement that have been tried on this river. To operate the snag boat *C. B. Reese* five months and the snag boat *Arkansas* nine months each year an annual appropriation of $35,000 is required.

The balance available will be expended in operating snag boats, and also in experimental dredging, provided a suitable dredge can be chartered.

The amount estimated as being needed during the fiscal year ending June 30, 1906, is for snagging operations which are needed for the maintenance of channel.

Money statement.

July 1, 1903, balance unexpended		$78,524.15
Amount allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904		20,000.00
		93,524.15
June 30, 1904, amount expended during fiscal year:		
For maintenance of improvement	$26,910.25	
Less refundment	16.66	
		26,893.59
July 1, 1904, balance unexpended		71,630.56
July 1, 1904, outstanding liabilities		2,219.06
July 1, 1904, balance available		69,411.50
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904		35,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

July 3, 1832: For improving the navigation of the Arkansas River, Arkansas, Indian Territory, and Kansas (less $38 carried to surplus fund)	$14, 962. 00
March 3, 1835: For improving the navigation of the Arkansas River	40, 000. 00
March 3, 1837: For continuing the works	25, 000. 00
July 7, 1838: For the improvement of the Arkansas River (less $1,155.66 carried to the surplus fund)	38, 884. 34
From appropriations 1842–1844 (estimate)	80, 000. 00
August 30, 1852: For the improvement of the Arkansas River (less $269.47 carried to surplus fund)	39, 730. 53
From appropriations 1866–1878 (disbursements reported by Colonel Suter)	344, 831. 59
April 14, 1876: For removing the bar at Fort Smith, Ark	10, 000. 00
June 18, 1878; For removing the bar in the Arkansas River at Fort Smith	10, 000. 00
March 3, 1879:	
For improvement of Arkansas River between Fort Smith, Ark., and Wichita, Kans	20, 000. 00
For removing snags, sand bars, wrecks, and other obstructions, and correcting and deepening the channel * * * on the Arkansas River	30, 000. 00
June 14, 1880:	
For improvement of Arkansas River between Fort Smith, Ark., and Wichita, Kans	15, 000. 00
For improving Arkansas River at Pine Bluff	25, 000. 00
For removing snags, wrecks, and other obstructions * * * on the Arkansas River	35, 000. 00
March 3, 1881:	
For improving Arkansas River between Fort Smith, Ark., and Wichita, Kans	24, 000. 00
For improving Arkansas River at Pine Bluff	23, 000. 00
For improving the Arkansas River	25, 000. 00
August 2, 1882:	
Continuing improvement between Fort Smith, Ark., and Wichita, Kans	20, 000. 00
Continuing improvement at Pine Bluff, Ark	20, 000. 00
Continuing removal of snags, wrecks, * * * from the Arkansas River	35, 000. 00
July 5, 1884:	
For survey of the Arkansas River from Little Rock to the mouth	19, 000. 00
Improving Arkansas River at Pine Bluff, Ark	55, 500. 00
For removing obstructions in Arkansas River from its mouth to Wichita, Kans	36, 000. 00
For the protection of the harbor at Fort Smith, Ark	5, 000. 00
August 5, 1886:	
Continuing improvement, according to plan and recommendation in Appendix V 13, Executive Document No. 1, Forty-ninth Congress	75, 000. 00
For the removal of snags, wrecks, and other obstructions	19, 875. 00
August 11, 1888:	
Continning improvement * * * between Wichita, Kans., and the navigable mouth of the Arkansas River	150, 000. 00
For removing obstructions	25, 000. 00
September 19, 1890:	
Continuing improvement from Wichita, Kans	180, 000. 00
For operating snag boats and removing obstructions	20, 000. 00
July 13, 1892:	
Improving Arkansas River, Arkansas and Indian Territory	250, 000. 00
Removing obstructions and operating snag boats	20, 000. 00
August 18, 1894:	
Continuing improvement ($10,000 may be used in removing obstructions and operating snag boats)	250, 000. 00
Removing obstructions and operating snag boats	20, 000. 00

June 3, 1896:	
Continuing improvement ($15,000 may be used in removing obstructions and operating snag boats)	$100,000.00
Removing obstructions and operating snag boats	20,000.00
March 3, 1899:	
Continuing improvement ($50,000 may be used in removing snags, sand bars, and other obstructions)	100,000.00
Removing obstructions and operating snag boats	20,000.00
June 13, 1902: Continuing improvement and for maintenance, including the general improvement and removing obstructions and operating snag boats	110,000.00
Total appropriations	2,350,783.46
September 15, 1900: Allotted from emergency river and harbor act June 6, 1900, for repairs to Red Fork revetment	10,000.00
June 7, 1904: Allotted from emergency river and harbor act, approved April 28, 1904	20,000.00
Total appropriations and allotments	2,380,783.46

EXPENDITURES.

For removing obstructions and operating snag boats	$1,071,251.83
For original construction of works for permanent improvement, including survey of river from Little Rock to the mouth	903,311.93
For maintenance of works for permanent improvement	334,589.14
Total expended to June 30, 1904	2,309,152.90
Unexpended July 1, 1904	71,630.56
	2,380,783.46

CONTRACT IN FORCE (EMERGENCY).

Name and address of contractor: Hunter & Frey, Memphis, Tenn.
Nature of contract: Repairs to Red Fork revetment.
Rate:
    Stone, per cubic yard, $5.75 in place.
    Brush, per cord, $10.50 in place.
Contract approved December 8, 1902.
Work began January 25, 1903.
Expiration of contract, April 22, 1903.
Extension, reasonable time.
Completed, August 10, 1903.

COMMERCIAL STATISTICS.

No report was received of any commerce above Webbers Falls, Ind. T., nor between Fort Smith, Ark., and Shoal Creek, 88 miles below. Swan Lake, 80 miles above the mouth, was the head of navigation during the period of lowest water this fiscal year. The Pine Bluff packet from Memphis could not get above that point during the month of December, 1903.

List of vessels that navigated Arkansas River from May 31, 1903, to June 1, 1904.

Name.	Net tonnage.	Draft loaded. Steamer.	Draft loaded. Barges.	Between—	Round trips.	Passengers.
		Ft. in.	*Ft. in.*			
Quickstep	66	3 0	3 6	Arkansas City and Garland Lake	68	1,000
Thurman	16	1 6	3 0	Little Rock and Perryville	16	
Roan	39	2 0		Rafting out of lower river to Arkansas City.	(?)	
Victoria	12	2 6		do	10	
Hazel Rice	138	3 6	6 0	Helena and Smith Cut-off	10	
J. N. Harbin	266	3 0		Memphis and Victoria	1	964
				Memphis and Swan Lake	3	
				Memphis and Pine Bluff	22	
Lucille Nowland	298	5 0		do	25	578
Delta	571	6 6		Memphis and Little Rock	1	220
A. D. Allen	67	4 0		Little Rock and Pine Bluff	30	280
				Little Rock and Littles	1	4
Dardanelle	164	3 6	3 0	Little Rock and Pine Bluff	10	255
				Little Rock and Cardens Bottoms	10	
				Excursion trips	44	8,800
Henry Sheldon	220	3 6		Little Rock and Shoal Creek	2	14
				Little Rock and Cardens Bottoms	6	
				Excursion trips	23	5,672
				Little Rock and Pine Bluff	12	
Mary D	40	2 6		Fort Smith and Webbers Falls	15	
Nettie	64	2 0	3 0	Towing to Garland Lake	(?)	
Wash Honshell	135	3 6	6 0	Cairo and Smith Cut-off	4	
Climax	(?)	3 0		Rafting out of lower river to Arkansas City.	28	

Classification of commerce reported, year ending May 31, 1904.

Articles.	Tons.	Articles.	Tons.
Cotton	2,652	Railway ties	3,333
Cotton seed	5,025	Crushed rock	3,564
Grain	3,516	Square timber	1,360
Lumber	2,273	Gravel	3,498
Provisions	3,088	Miscellaneous freights	4,503
Saw logs	51,020		
Staves	6,149	Total tonnage reported	92,041
Cement	2,060	Estimated value	$2,079,893

W 2.

IMPROVEMENT OF WHITE RIVER, ARKANSAS.

Operations this fiscal year.—Operations were confined to operation of and maintenance of snag boats. The snag boat *C. B. Reese* came into this river August 16 and worked between the mouth of the river and Augusta (203 miles) until November 23 when operations ceased and the boat was run to Newport and laid up. The boat worked over the river between the mouth and Gregory twice, and three times over the river between Gregory and Augusta.

The snag boat *Quapaw* worked between Augusta and Newport (55 miles) during the month of August.

In addition to the work shown in the table below, the *C. B. Reese* removed three abandoned pile foundations for piers of a proposed bridge across the river at Aberdeen. In doing this work 365 piles were pulled.

Summary of work accomplished by snag boats C. B. Reese and Quapaw.

Boat.	Work done between—	Distance.	Snags removed.	Drifts broken.	Trees cut.	Miles run.
		Miles.				
C. B. Reese	Mouth of White River and Augusta	203	468	5	5,056	933
Quapaw	Augusta and Newport	55	286	4	369	194
	Total, mouth of White River to Newport.	258	754	9	5,425	1,127

On May 31, 1904, the Secretary of War allotted $7,100 to this river from the appropriation of $200,000 for emergencies in river and harbor works, act of June 13, 1902. Immediately upon receipt of notification that this allotment had been made the members of the snag-boat crews were directed to proceed to Newport and put the boats in condition for active work. Both boats will be ready for the field the first of the new fiscal year.

The available balance is to be expended in snagging operations.

The amount estimated as being needed during the fiscal year ending June 30, 1906, is for snagging operations which are needed for maintenance of channel.

Money statement.

July 1, 1903, balance unexpended	$12,066.03
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	7,100.00
	19,166.03
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	8,793.37
July 1, 1904, balance unexpended	10,372.66
July 1, 1904, outstanding liabilities	727.45
July 1, 1904, balance available	9,645.21
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	22,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Appropriations for this river have been partly for limited reaches, partly for the whole river, and partly for this river in combination with others.

The appropriations for this river separately and for reaches of it are as follows:

June 23, 1874	$50,000.00
August 14, 1876	10,000.00
March 3, 1879	10,000.00
June 14, 1880	20,000.00
June 14, 1880	5,000.00
March 3, 1881	8,000.00
August 2, 1882	6,000.00
August 2, 1882	4,000.00
July 5, 1884	35,000.00
August 5, 1886	18,000.00
August 11, 1888	25,000.00
September 19, 1890	30,000.00
July 13, 1892	75,000.00
August 18, 1894	52,000.00
June 3, 1896	$22,000.00
March 3, 1899	14,815.00
June 13, 1902	22,000.00
May 31, 1904, allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	7,100.00
Total	413,915.00
Expended to June 30, 1904	403,542.34
Balance July 1, 1904	10,372.66

COMMERCIAL STATISTICS.

No report was received of any steamboat commerce above Jacksonport. Below Jacksonport the river was navigable all the year.

List of vessels that navigated White River, Arkansas, from May 31, 1903, to June 1, 1904.

Name.	Net tonnage.	Draft, loaded.		Between—	Round trips.	Passengers.
		Steamer.	Barges.			
		Ft. in.	*Ft. in.*			
Ozark Queen	136	3 0	....	Augusta and Rosedale	24	200
City of Idaho	66	3 6	4 6	Newport and Rosedale	30	300
Quickstep	66	3 0	3 6	Arkansas City and Mary Magraw Lake.	52	600
Harry Waltz	63	2 0	4 0	Newport and points on Black River,	83	67
Jack Rabbit	72	3 0	....	Rosedale and Clarendon	32	180
Susan	178	4 0	4 6	Augusta and Rosedale	20	....
Hosmer	52	3 6	6 0	Towing ties, Little Red River and Mississippi River.	35	....
A. R. Bragg	162	4 0	5 0	Newport and Black River	51	100
Krata	31	3 0	5 0	.....do	18	25
F. W. Tucker	99	4 0	5 0	.....do	43	75
Welcome	28	2 0	3 0	Jacksonport and Augusta	16	60
A. D. Allen	67	4 0	....	Rosedale and Augusta	5	25
Greyhound	9	4 0	6 0	Greenville and points on Bayou La Grue.	2	....
Mildred	....	....	....	Towing timber to Augusta	....	....
Gen. Joe Wheeler	65	2 6	....	Newport and Indian Bay	2	....
Nettie	64	2 0	3 0	Towing to Mary Magraw	....	....
Geo. Pope	62	2 6	3 6	Des Arc and Rosedale Towing timber to Judsonia	2	....
J. B. Galloway	37	3 0	5 0	Little Red River and Crocketts Bluff.	80	....

Classification of commerce reported, year ending May 31, 1904.

Articles.	Tons.	Articles.	Tons.
Cotton	4,445	Cement	1,546
Cotton seed	1,875	Crushed stone	1,442
Lumber	25,191	Square timber	1,040
Provisions	1,118	Sand	3,507
Saw logs	74,669	Miscellaneous freights	781
Staves	18,075		
Railway ties	55,889	Total tonnage reported	193,498
Mussel shells	3,920	Estimated value	$1,021,778

W 3.

IMPROVEMENT OF UPPER WHITE RIVER, ARKANSAS.

Operations this fiscal year.—At Lock and Dam No. 1, a new abutment and accompanying bank protection, 336.5 linear feet of new dam, and 1,150 linear feet of high-water sills across the swale at foot of Ramsey Mountain were built; the 324 linear feet of dam built in fiscal year 1903 was changed from a step to a slope dam and its wooden apron replaced with one of concrete; new shafts and operating gear for the lower valves were placed; the lower gates were repaired, and some of the temporary structures used in construction work were removed. This lock and dam was placed under the appropriation for "Operating and care of canals" on January 16, 1904.

On account of the great depth to bed rock at the site of the new abutment, and because of the old dam acting as a dike to deflect the the water across that site, it was decided that open cofferdam work would be too hazardous and too susceptible of interruption to undertake, considering that it was greatly desired that the new abutment and new dam be completed before winter set in. Asst. Engineer P. R. Van Frank, jr., suggested the use of a crib foundation with grouted filling, and under my direction prepared the detail plans by which the work was built.

At Lock and Dam No. 2, little work was done during the year. The 250 linear feet of dam built in fiscal year 1903 was changed from a step to a slope dam; both of the upper guide cribs were completed; new roofs of tarred felt were placed on the mess hall and on two of the buildings used for laborers' quarters; a new hull was built for the dipper dredge and all the floating property put in good condition for work during the coming low-water season, when the dam at No. 2 is to be completed. The lock yard at No. 2 and the shipyard adjoining the lock yard at No. 1 were fenced, and excavation for the protection crib below abutment No. 2 was commenced.

The following extract from report of Mr. William Parkin, assistant engineer, gives detailed information concerning the work done at Lock and Dam No. 1 during this fiscal year:

NEW CONCRETE ABUTMENT.

General description.—This abutment is T-shaped, river face 136 feet, and the stem 60 feet long over all. Altogether it is 40 feet high and is founded on a rock-filled timber crib surrounded by sheet piles, the voids in the mass of riprap being filled with rich Portland cement grout, so introduced, through wooden pipes, as to fill the voids from the bottom upward.

Abutment construction.—Excavation was begun by the $1\frac{1}{4}$-yard dipper dredge *Van Frank* on June 22, 1903, and by a $\frac{3}{4}$-yard orange peel bucket on July 3, the latter being first handled by a land derrick and later by a derrick boat. Two shifts were used on both outfits, and, although most of the material was handled three times, the excavation was completed August 12 and the foundation crib was floated into the cut the next day. Fully nine-tenths of the work was done by the dipper dredge, the orange peel being unable to do much in the hard gravel. The average depth of cut below low water was 11 feet, and the digging was done at about 4-foot stage. The foundation bed secured was coarse gravel and bowlders overlying bed rock, which is at a depth of about 18 feet below extreme low water. The foundation crib was built of 10 by 10 timbers, conforming generally to the shape of a T, with a head 136 feet and a stem 60 feet long over all, the river arm being from 12 to 24 and the stem 20 feet wide. This was built in one piece in the water and floated into position August 13, three shifts being used in building and sinking the crib and in driving the triple and double lap-sheet piles with which the crib was surrounded. Triple lap-sheet piles were driven, by two steam pile drivers, on the upper side and all the river side except about 30 feet at the lower end below the dam. The balance of the crib was surrounded by double lap 1-inch plank, driven by mauls to bowlders or refusal. In order to save time the driving of sheet piling was begun as soon as the crib was weighted with rock sufficient to insure its stability and final settlement. Driving was started August 18 and completed the 25th.

Filling the crib with riprap was begun August 19 and completed up to elevation 272 on the 28th, but before the filling was begun vertical grout boxes were set about 10 feet apart through the two crib axis, after which the pens were filled to the desired height. These boxes were built of rough 2-inch plank 8 inches square inside and perforated on each side with a $1\frac{1}{2}$-inch hole per foot, equal to four holes per linear foot of box. As soon as the filling was completed planks were laid over practically all the crib and eight mixing boxes erected for mixing and pouring grout into the grout boxes that had already been set in the riprap. The mixing boxes were made of 2-inch plank and set with their bottoms about 16 inches above the floor; they were 1 by $4\frac{1}{2}$ by 5 feet in size and fitted with two sliding doors at opposite corners, and as the boxes were tilted slightly toward the side upon which the doors were, the grout flowed quite freely out of the box and was led by short troughs to half barrels which set over the grout boxes being fed. These half barrels each had a short piece of 2-inch pipe screwed into the bottom and were a sort of receiving hopper for the grout and fed the same into delivering boxes or pipes made of 1-inch plank having a 3-inch square cross section which set inside the perforated grout boxes, the object being to deliver a solid column of grout always to the lowest voids in the mass of riprap which it was desired to consolidate into concrete. The grout boxes were fed alternately to insure the best possible distribution of the grout. The small delivering boxes on the inside of the grout boxes were shortened from time to time as the soundings showed the rise of the grout in the riprap, and were sometimes used as dashers to churn a batch of grout just delivered and by wave action thus produced move the grout as far from the perforated boxes as possible. This was probably unnecessary, as observations when the crib was pumped out showed the grout with only 6 inches depression between two grout boxes 10 feet apart, equal to a slope for 5 feet of 1 on 10.

The material for the grout was delivered on barges alongside the work, and was mixed in batches of one barrel Portland cement to two barrels of sand, the latter being obtained from the river bank about 300 feet below the work. From four to six men were used at a box mixing with hoes and the mixing was kept up until the boxes and half barrels were thoroughly clean of grout. The sand and cement were first mixed dry to a uniform color. Water was obtained from the river by several Excelsior force pumps and the grout was made exceedingly thin. About 1¼ barrels cement were used per eight-hour-day labor, paid for on the grout, which includes all labor, building platforms and boxes, obtaining sand from the bank 300 feet below the work, cement from the warehouse on top of the opposite bank, one-fourth mile away, as well as the actual work of mixing and placing the grout. At the boxes, one man actually mixed two to three barrels per day of eight hours.

On August 24 the dredge began to place back fill (from the spoil banks) around the abutment, and on the 26th teams began filling from the land sides, the fill serving two purposes; first, to prevent the escape of grout from the crib, and later to act as a cofferdam, permitting the crib to be pumped out while the grout was yet 6 feet below the surface of the river. The grout reached this elevation September 4, and an effort was then made to pump out the inclosure, but a strong leak developed in the bottom near the upper end, which, judging by the temperature of the water, was a spring inclosed by the crib. After building the necessary forms, the pit was allowed to fill and a cross dam of rich gravel concrete 10 feet wide was deposited in the water about 10 feet downstream from the leak. September 6 was Sunday and the 7th was Labor Day, but on the 8th the pit was pumped out and a foot of hand-mixed concrete deposited over that portion of the crib below the concrete cross dam, except right at the centrifugal pump, which was set at the lower end of the crib. Arrangements were then made for mixing the rest of the concrete by machine and the concrete was all in place September 22. The space above the concrete dam was filled by concrete deposited in water, the skip coming to rest on the bottom before being dumped, but the balance of the concrete was placed in the dry. The mixture for the dam was 1 barrel cement, 4½ cubic feet sand, and 20 cubic feet of gravel just as it came from the river, and for the balance of the abutment 1 barrel cement, 5 cubic feet sand, and 27 cubic feet of river gravel which averaged about 18 per cent of sand. The concrete was mixed in a 4 by 4 foot cube mixer set on a barge and was transferred from the mixer to the forms by derrick boats. The interior timbers were removed from the crib where the concrete was placed in the dry, but in the upper end, where the concrete was deposited in water, only about one-third of the cross-ties were removed.

The forms were all off the abutment by September 26, but although the dredge assisted the teams in placing back fill until the bank got too high for her, the back fill was not completed until December 18, it being necessary to divert the teams to other work.

The concrete superstructure proper was set 5 feet back from the river face of the crib, but extended to the back face of timbers in stem, being over all in this direction 55 feet and 132 feet along the river face. The abutment was faced on exposed surfaces with 1 to 3 mortar, 1½-inch thick, brought up with the concrete, and was finished on top with 1 to 2.

Abutment protection.—The bank above the abutment is protected for a distance of about 150 feet by hand-placed riprap and the rear of the abutment by a levee 300 feet long, reaching diagonally upstream to a knoll at elevation 307, five feet above the top of the abutment. This levee is carefully paved with stone, especially at the outer end, where it connects with the abutment at the river end of the stem. Below the abutment the bank is protected for 650 feet, the first 200 feet by a protection crib 16 feet wide, 200 feet long, and 21 feet high, the top being 8 feet above extreme low water, and first-class bank paving behind same, and the other 450 feet by regular bank revetment, consisting of an excellent mattress of brush beginning 30 feet above the lower end of the 200-foot crib and extending downstream 480 feet, and a carefully paved bank. The 200-foot crib is founded on coarse gravel close to bed rock or bowlders, and leaves the lower end of the abutment at an angle of about 20°, following the trend of the bank, which recedes somewhat from the general course of the river at this point. All the bank is graded to a slope of 1 on 2, and the paving extends to the top of the bank. The mattress will average 40 feet in width and was partly fascine and partly a woven mat.

The dredge started excavation for the protection crib September 4, and on the 25th the crib was floated into position, it having been built in quiet water some distance above the dam. The crib was finished October 10, and all the mat work and bank protection below the abutment was completed by October 31, except the portion immediately at the abutment where the back fill was not yet finished. A great deal of the back fill was obtained from the bank above the abutment, it being desirable to widen the river at that point, and the long haul (300 to 500 feet) made the work somewhat costly and slow. The back fill was finally completed December 18, and all the paving January 6, 1904. This includes the levee and paving thereon, and is really the last date upon which work was done on Lock and Dam No. 1 proper, the dam having been completed in the meantime.

Changing old dam from step to slope.—The original dam, 324 feet long, was a rock-filled timber crib, 48-foot base, with two 8-foot steps and a 16-foot apron, the top of the latter being about 1½ feet above extreme low water and was built in 1902. It was ordered changed to a 1 on 4 slope dam and the change was made between September 25 and October 7, 1903. The two 8-foot steps were torn out and the 16-foot apron removed where above elevation 275.8. The timber apron was replaced by one of gravel concrete using Portland cement, the mixture being 1; 2; 5. On account of the stage of water when the work was done, it was necessary to deposit most of the concrete in water. The concrete apron, containing 573 cubic yards of concrete, averages 3 feet in thickness, the top elevation being 278.8. Part of it is directly on the old timber apron, and where the apron had raised and the timbers had been removed, the concrete is directly on the riprap filling. The toe sticks, upon which the slope timbers rest, are wedge shaped and are bedded in the concrete.

* * * * * * *

Extension of main dam.—This extension is of the same general design as the rebuilt part of the dam, except that it has a timber instead of a concrete apron. The extension is 336.5 feet long, making the total length of dam 660.5 feet on the crest. The maximum height is 31 feet. In the vicinity of the old abutment it was founded to a great extent on the large masses of concrete composing the ruins of the same, and on the large derrick stone which had been placed around the end of dam to prevent it undermining. The next 70 feet was founded partly on large masses of the old abutment concrete, lying in very deep water, but mostly on the river bottom, which had scoured out to bed rock at this point, the lowest elevation being 256, equal to 18 feet below extreme low water. The balance of the dam rests on bowlders and gravel dredged to elevation 262.

The matter of removing the mass of material next to the wrecked abutment was considered, but it was finally decided to remove the large derrick stone and concrete above water and to build the dam around the concrete under water, fitting it as well as possible, and anchoring the crib to the concrete with iron bolts where the concrete was not too deep. The holes for the bolts were at least 18 inches deep, and after the split bolt had been well driven upon the iron wedge in the bottom of the hole, cement grout was poured into the hole until it was full. Where the holes were under water, pipes were slipped over the bolts, through which to pour grout. The upper end of the bolts pass through at least one of the 10 by 10 timbers of the dam and are fastened down with nut and washer, the bolts having been cut to proper lengths. This was the first section of the dam built, and was 59 feet long.

As soon as the dredge finished the cut for the 200-foot protection crib below the abutment she commenced dredging for the foundation of the new dam. Several days before this a crew began building a section of the dam 100 feet long. This section was built up until it drew about 6 feet of water, after which a second section of the same length was started. Both of these sections were built in the water at the shipyard, about 600 feet above the dam. They were floated down to the work several days before the dredge, which was working night and day, finished the cut for the first 100-foot section next to the new abutment. As soon as the cut was finished for the first 100-foot section, it was floated into position and built up until there was enough timber in the crib to equal the average depth of the water plus 2 feet, when the crib was weighted with stone, care being taken to always pile the rock where the crib was the highest, so the crib might settle as nearly level as possible. The rock was placed upon planks laid over the alternate pens, leaving every other pen open and ready to be filled with stone as soon as the sinking or weighting of the crib should be completed. The dredge had so much material to move in the cut for the dam (partly spoil bank from the abutment excavation) that she had to pile it up high on both the upper and lower sides of the cut, and much of the excavated material had to be handled several times. As generally happens in deep digging (18 feet), especially when the material is wasted in banks along the cut, there was considerable variation in the elevation of the bottom of the excavation, due partly to material sliding back and, in some cases, to bowlders, too large for the dredge to move, sticking up above the level of the bottom cut elsewhere by the dredge through the gravel.

In order to prevent the dam from assuming the shape of the bottom of the excavation it was decided beforehand, from careful soundings taken before and after the crib was in position, to what depth the crib should be sunk, and the height of timber regulated accordingly. In sinking, the crib was kept level, so that when it struck bottom it would strike first at the desired elevation, and not down in some depression to which the balance of the crib could not be forced. Another reason for taking care to sink the dam level was that it is next to impossible to reach bottom and weight a crib so it will be on line when completed, unless kept level when sinking. After the crib had been weighted on the high points until it would sink no more the pens not weighted were almost entirely filled with riprap, after which the riprap used to weight or sink the crib was thrown into the already almost filled pens, the planks over the alternate pens removed, and the timber work resumed. The lining up of the cribs, of course, was a simple matter, the transit being necessary only to get a few points accurately set, after which the balance of the lining up was done very satisfactorily with the eye and the carpenter's lines.

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The last section of the dam, however, was far from being an ordinary case, and gave more trouble than all the rest of the dam. This section was the closing one and was 70 feet long, and the bottom over which it was built varied from 5 to 21 feet in depth, the variations being due almost entirely to the large pieces of the old concrete abutment which was destroyed by being flanked the season before. Careful soundings were taken, and the crib built to suit the bottom as nearly as possible, but as the largest mass of concrete was near the downstream wall of the dam, this wall had little support from interior timbers, and to strengthen this wall a crib 20 by 65 feet in plan was sunk just below this section of dam, the top of crib being at same elevation as the apron and the foundation bed about the same as the dam. The crib, however, settled in very good shape, there being not over 6 inches difference in the elevation of any part of it. At one point the timbers struck rock too soon, the timber being 10 inches onto a rock which it was calculated it would miss, but the timber was cut off by dynamite, after which the crib settled in good shape. Had this been any but the closing section of the dam, the weight of rock could have been moved and the crib pulled slightly toward the abutment, but as it was there was no remedy but the dynamite or a diver.

In putting on the crest, slope, and apron timbers the plan was adopted of putting these timbers on in 10-foot sections—that is, completing the dam (except sheeting the upstream face) on the filled 10-foot alternate sections. The upstream slope timbers were all laid and toe nailed, the pieces over the filled pens drifted, and the sticks over the empty pens were then taken off and laid back on the dam, ready to be put in place as soon as the pens were filled. The downstream-slope timbers and apron sticks were not laid down over the empty pens, as they did not have to fit close like the upstream sticks. They were delivered at the dam on 10 by 40 by 2 foot barges, and put in place faster than they could be drifted down. The decks were laid, as before stated, in 10-foot sections, in order to cut down to a minimum the amount of carpenter work to be done after all the pens were filled with stone. Part of the timbers were placed on the dam by steam derrick boats, but much of it was handled by raising boats, consisting outside of the boat itself, of a fixed inclined timber reaching 7 or 8 feet beyond the bow of the boat to a height of 10 or 12 feet above the water, a windlass and a sheave at the end of the boom. Two of the little boats were used, one above and one below the dam. The boats were 2 by 10 by 40 feet.

Framing timber for the 59-foot section of the extension was begun October 7. The first 100-foot section was swung into position next to the new abutment at 9.15 p. m., October 24; the second 100-foot section, on the 28th, and the closing section, 70 feet long, at 5.30 p. m., November 3. All framing possible was done on the yard before the construction of the dam was commenced. The filling of the dam with stone and also the carpenter work was completed November 23, and the water began running over the dam at noon on November 28.

Most of the back fill was dug by the dipper dredge, but the orange peel handled probably one-fourth of it. One side-dump scow was used with a capacity of 60 cubic yards, and also several flat boats, 4 by 20 by 100 feet, which were unloaded by both wooden and iron scrapers handled by winches on a derrick boat below the dam. As the engine had two winch heads, two scrapers could be worked at once. The first back fill was placed November 14 and the last December 17, about 800 yards per day being placed. Most of the time the weather was bitter cold and windy, making this part of the work exceedingly uncomfortable and freezing out many of the men.

Protection cribs.—As the old abutment was founded on piles, and as it was not removed, it was deemed advisable to surround the downstream end of the structure remaining with a rock-filled crib to prevent any possible underscour. This crib was L-shaped, 20 feet wide, 42 feet long up and down stream, and 46 on the other arm. On the other side of the old abutment and immediately below the 59-foot section of dam which set on the ruins of the old abutment another crib was built, which was 20 feet wide and 42 feet long, thus entirely inclosing with cribs the lower side of the old abutment on piles. These cribs were all founded on gravel and bowlders at varying depths, the bed being full of derrick stone and bowlders too large for the orange peel to move, and averaged probably 6 feet below extreme low water.

A corner crib, about 24 by 60 feet in plan, was built below the dam, next to the new abutment, to prevent possible scour from overfall, etc. As a further protection to the dam 642 cubic yards of large derrick stone was placed below the cribs and apron of the dam at such points as was thought to be most subject to attack. This, the last work directly on the dam, was completed December 23, 1903.

Repairs to lower lock gates.—The lower gates which had been badly wrenched during a freshet soon after the abutment was flanked in 1903, were repaired in August, 1904. A needle cofferdam was used and the pit pumped out by a 10-inch centrifugal pump. Several feet of soft mud deposit delayed the work considerably, but when this was finally removed the repairs were soon made. The lower timbers of both gates had been subjected to such great pressure that, in spite of the numerous longitudinal 1⅛-inch bolts which passed through all timbers from top to bottom of gate, they had been slipped from their original positions, each timber being a little farther downstream than the one below it, resulting in a series of steps on the upstream side of the gate for a height of several feet, each step having a 10-inch rise and one-half to 1½-inch tread. These timbers were forced back into position by jacks and tackle without taking the gates down, but it was impossible to take all the bend out of the gate, and although the gates are being used, there is more leakage than there should be. New journal castings were put in, the old ones being broken.

Sills.—These structures were designed to prevent erosion by high water of the low ground about one-half mile back of the abutment, and are three in number. The principal one follows a county road, is 1,000 feet in length, and consists of a well-laid pavement 40 feet wide, the downstream 12 foot being laid on a double layer of the best brush obtainable in the vicinity, the tops of which were allowed to project downstream 15 feet below the edge of the paving. On top of the pavement a 6-inch layer of crushed limestone, 12 feet wide, was placed to prevent wagon travel from injuring the paving. Two other structures were placed farther upstream at the head of small "draws" to prevent their enlargement. This work was begun December 29, 1904, and was finished January 16.

General.—Outside of the work of the sills, the season's work, beginning with the excavation for the abutment and ending with the completion of the dam, was carried on night and day. Although the river did not get lower than 2 feet above low water, the season was a very successful one.

* * * * * * *

It is believed that the paving behind the land wall of the lock should have been laid normal to, instead of with, the current, thus doing away with continuous joints parallel with the current, as after the last rise it was noticed that considerable of the gravel filling had washed out of the joints.

Plant used.—The plant used is described in the previous reports, but in brief, the floating plant consisted of six decked barges, 4 by 20 by 100 feet; two derrick boats, 4 by 26 by 60 feet; and several scows, 2 by 10 by 40 feet, all of which were built on the works. In addition, there was a dipper dredge with a wooden hull, already on hand, and a towboat was secured from the Arkansas River at the cost of raising the boat which had been sunk a short time before. The steamboat has been rebuilt, and could have been built new for the money spent. The dredge has had a new hull, but this was paid for by Lock No. 2, as was about half the expense of the new hull for the *Cleveland*.

The bank plant consisted of various hoisting engines, boilers, and derricks; one concrete mixer, and, roughly speaking, about one-half the bank plant was on hand at the beginning of the work. This plant was common to both Locks 1 and 2, and the expense has been divided as nearly equal as possible between them.

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The elevations used in this report and on the plans are referred to an assumed datum and 37.92 feet has to be subtracted from the elevations given to obtain the correct elevation above tide at Biloxi, Miss.

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Recommendation regarding future operations.—For the reasons given in my last annual report (Annual Report, Chief of Engineers, 1903, p. 1426) I do not consider this stream as worthy of improvement at this time by means of locks and dams. If, however, Congress should decide to continue the improvement the next appropriation should be $211,000 for the construction of Lock and Dam No. 3.

The balance available July 1, 1904, will be expended in completing Lock and Dam No. 2.

Money statement.

July 1, 1903, balance unexpended		$185,558.49
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$120,065.32	
Less refundment	1.00	
		[a]120,064.32
July 1, 1904, balance unexpended		65,494.17
July 1, 1904, outstanding liabilities		4,835.26
July 1, 1904, balance available		60,658.91
Amount (estimated) required for completion of existing project		1,020,000.00

APPROPRIATIONS.

March 3, 1899	$160,000.00
June 6, 1900	150,000.00
June 13, 1902	270,000.00
Total	580,000.00
Expended to June 30, 1904	514,505.83
Unexpended July 1, 1904	65,494.17

CONTRACTS.

Name and address of contractor.	Nature of contract.	Rate.	Contract approved.	Work begun.	Expiration of contract.
			1903.	1903.	1903.
Robt. W. Barnheart, Batesville, Ark.	5,000 cubic yards stone.	70 cents per cubic yard.	Mar. 24	July 30	[b]June 1
	.....do	73 cents per cubic yard.			
W. B. Ferguson,[c] Little Rock, Ark.	160,233 feet B. M. oak timber.	$15 per 1,000 feet B. M.	Apr. 1	May 27	Aug. 15
Urania Lumber Co. (Limited),[b] Alexandria, La.	259,297 feet B. M. pine timber.	$9 per 1,000 feet B. M.	Apr. 6	Apr. 16	Do.
Edwin S. Healey, St. Louis, Mo.[c]	2,600 barrels cement (Lehigh).	$2.70 per barrel	May 2	June 15	July 15
				1904.	1904.
Urania Lumber Co. (Limited),[c] Alexandria, La.	61,965 feet B. M. pine lumber.	$15 per 1,000 feet B. M.	Dec. 30	Feb. 1	Mar. 1

[a] Lock No. 1, $83,002.71; Lock No. 2, $37,010.11; Lock No. 3, $51.50.

[b] Extension for a reasonable time; completed Oct. 20, 1903.

[c] Emergency contract.

CONTRACTS—continued.

Name and address of contractor.	Nature of contract.	Rate.	Contract approved.	Work begun.	Expiration of contract.
Albright & Ferrill,[a] Batesville, Ark.	9,000 cubic yards stone riprap.	78 cents per cubic yard	July 14	1903. July 20	1903. Oct. 1
Jas. G. Clark,[b] Beirne, Ark.	81,200 feet B. M. pine lumber.	$12 per 1,000 feet B. M.	1904. Feb. 3	1904. Feb. 15	1904. May 15
	3,733 feet B. M. pine lumber,	$12.50 per 1,000 feet B. M.			
	35,000 feet B. M. pine lumber.	$11 per 1,000 feet B. M.			
	2,000 feet B. M. pine lumber.	$8 per 1,000 feet B. M.			
	2,133 feet B. M. pine lumber.	$8.50 per 1,000 feet B. M.			
	1,667 feet B. M. pine lumber.	$9 per 1,000 feet B. M.			

[a] Emergency contract.

COMMERCIAL STATISTICS, YEAR ENDING MAY 31, 1904.

The only steamboat commerce reported for this river this fiscal year was that done by the steamer *Twins*, a boat 80 feet long, 31 feet wide, and 3 feet deep in hold, built primarily for use as a ferry at Batesville. This boat made two or three freight trips from Batesville to Wyatts Landing, at the head of Pool No. 1, carrying 120 tons of live stock and 20 tons of miscellaneous freights. The rafted commerce for the year was 100 tons of cedar and 15,415 tons of railway ties, making the total commerce 15,655 tons, the estimated value of which is $29,120.

W 4.

OPERATING AND CARE OF LOCK AND DAM NO. 1, UPPER WHITE RIVER, ARKANSAS.

This lock and dam, located about 1 mile below Batesville, Ark., was built from funds derived from appropriation for improving Upper White River, Arkansas, and was completed in January, 1904.

The estimate and project for the operation and care of this lock and dam from January 1, 1903, to the close of this fiscal year was approved by the Secretary of War December 26, 1903, and included the following items:

Wages of one lockman, 6 months, at $50	$300
Labor (intermittent service), 90 days, at $1.50	135
Lights and fuel, 6 months, at $10	60
Redredging lower approach after spring freshet	80
Miscellaneous supplies	25
Total	600

Expenditures under this allotment began January 16, 1904, since which date they have been for the payment of wages of a lock master and other services, for minor articles of property, and for a small quantity of repair material. The lock gates, valve gearing, gate spars, and snubbing posts have been repainted; the lock grounds kept clean;

weeds cut off the reservation; the grounds sown to grass; 250 linear feet of driveway "shaped up," and the channel approaches to the lock redredged.

Summary of expenditures on account of operating and care of lock and dam No. 1, Upper White River, Arkansas, during the fiscal year ending June 30, 1904.

Services, lock master and dredge crew	$327.50
Rent of telephone	15.00
General supplies	17.61
Outfit	1.75
Total expenditures, January 16, 1903, to June 30, 1903	361.86

Allotments.

December 26, 1903	$600.00
June 22, 1904	3,701.00
Total allotments	4,301.11

COMMERCIAL STATISTICS.

Traffic through the lock since January 15, 1904, consisted of 8,320 tons of rafted railway ties, 6 house boats, and 1 excursion steamer (two round trips), with a total of 135 passengers.

W 5.

IMPROVEMENT OF CACHE RIVER, ARKANSAS.

Operations this fiscal year.—Nothing done, the funds for this stream having been expended last fiscal year. Nothing contemplated for the fiscal year ending June 30, 1905.

Recommendation regarding future operations.—This stream is not navigable during extreme low water. The most satisfactory method of removing from it snags and similar obstructions has been by the use of chopping parties quartered in tents or on small scows with canvas housing, the scows being cheaply built boats that are abandoned at the close of the work. Heretofore $2,000 has been considered sufficient to remove the annual accumulations of snags and drift and to maintain the channel in its ordinary conditions, but as three high-water seasons will have passed before another river and harbor bill will become a law, the river will need more work in the fiscal year 1906 than has been given to it in any one year heretofore; therefore it is recommended that the appropriation for the restoration and maintenance of the channels of Cache River during the fiscal year ending June 30, 1906, be $3,000.

Money statement.

July 1, 1903, balance unexpended	$10.00
July 1, 1904, balance unexpended	10.00
July 1, 1904, outstanding liabilities	10.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	3,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS AND ALLOTMENTS.

August 11, 1888, mouth to Riverside	$7,000
July 13, 1892, mouth to Riverside	2,000
August 17, 1894, allotted from White River	2,000
June 3, 1896, allotted from White River	2,000
March 3, 1899, mouth to James Ferry	1,000
June 13, 1902, mouth to James Ferry	2,000
Total	16,000
Expended to June 30, 1904	15,990
Unexpended July 1, 1904	10

COMMERCIAL STATISTICS.

The river was too low for profitable navigation from about the 20th of July, 1903, to the latter part of December, 1903. Timber industries produced all of the commerce, 75 per cent of which was rafted.

List of vessels that navigated Cache River, Arkansas, from May 31, 1903, to June 1, 1904.

Name.	Net tonnage.	Draft, loaded.		Between—	Round trips.
		Steamer.	Barges.		
		Ft. in.	*Ft. in.*		
Susan	178	4 0	4 6	Clarendon and Maberry	8
Hosmer	52	3 6	6 0	Mouth of White River and tie camps on Cache River.	5

CLASSIFICATION OF COMMERCE REPORTED, YEAR ENDING MAY 31, 1904.

The commerce reported for the year ending May 31, 1904, consisted of 3,956 tons of saw logs and 11,911 tons of railway ties, having a total estimated value of $49,601.

W 6.

IMPROVEMENT OF BLACK RIVER, ARKANSAS AND MISSOURI.

Operations this fiscal year.—Operations were confined to the operation of and maintenance of snag boats. The snag boat *Quapaw* (steam propelled) was at work in this river at the beginning of the year. It worked here during the months of July, September, and

November, working twice over the river between Hogans Mill (30 miles above the mouth) and the mouth of Current River, and three times over the river below Hogans Mill. Operations ceased November 24 at Hogans Mill, and the boat was run to Newport the next day and laid up.

The snag boat *Riverside* (hand propelled) came into this river from Current River August 16, and worked up to Cross Slough (11 miles below Poplar Bluff) where operations were brought to a close by the failure of the tubes in the boiler November 24. The boat was cordelled to Poplar Bluff and laid up.

The work accomplished by the two boats is shown in the table below.

Boat.	Work done between—	Distance.	Snags destroyed.	Drifts broken.	Trees cut.	Miles run.
		Miles.				
Quapaw	Mouth of Black River and Current River	116	826	5	947	353
Riverside	Mouth of Current River and Cross Slough	112	452	22	1,598	127
Total	Mouth of Black River and Cross Slough	228	1,278	27	2,545	....

On May 31, 1904, the Secretary of War allotted $8,850 to this river, from the appropriation of $200,000 for emergencies in river and harbor works, act of June 13, 1902. This allotment is to be expended in operating the snag boat *Quapaw* below the mouth of Current River, and in procuring a new hull for the *Riverside* and in operating that boat from Poplar Bluff down to Corning Bridge.

The amount estimated as being needed for the fiscal year ending June 30, 1906, is for snagging operations which are needed for maintenance of channel. Experience with this stream has shown that the estimate of $8,000 annually, adopted in 1884, is inadequate, and for the reasons given in annual report for 1901, page 2122, and in annual report for 1903, page 1433, the estimate for work required annually for maintenance should be increased to $15,000.

Money statement.

July 1, 1903, balance unexpended	$10,747.87
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	8,850.00
	19,597.87
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	9,329.56
July 1, 1904, balance unexpended	10,268.31
July 1, 1904, outstanding liabilities	388.04
July 1, 1904, balance available	9,880.27
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	15,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Appropriations have been made for this stream separately under the heads of "Improving Black River, Missouri;" "Improving Black River, Arkansas;" and "Improving Black River, Arkansas and Missouri." They are as follows:

June 14, 1880	$15,000.00	March 3, 1899	$8,000.00
March 3, 1881	6,000.00	June 13, 1902	21,700.00
August 2, 1882	10,000.00	May 31, 1904, allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	8,850.00
July 5, 1884	20,000.00		
August 5, 1886	5,000.00	Total	141,050.00
August 11, 1888	5,000.00	Expended to June 30, 1904	130,781.69
August 11, 1888	7,000.00		
September 19, 1890	5,000.00	Unexpended July 1, 1904	10,268.31
September 19, 1890	7,000.00		
July 13, 1892	5,000.00		
August 18, 1894	9,500.00		
June 3, 1896	8,000.00		

COMMERCIAL STATISTICS.

All of the river that is under improvement, i. e., from the mouth to Poplar Bluff, Mo., was navigated by steamboats all the year.

List of vessels that navigated Black River, from May 31, 1903, to June 1, 1904.

Name.	Net tonnage.	Draft loaded.		Between—	Round trips.	Passengers.
		Steamer.	Barges.			
		Ft. in.	*Ft. in.*			
G. W. Huff	66	3 0	4 0	Skaggs Ferry and Jacksonport	29	180
A. R. Bragg	162	4 0	5 0	Black Rock and Newport	51	100
C. E. Taylor	50	3 0	4 0	Black Rock and Strawberry	2	....
F. W. Tucker	99	4 0	5 0	Black Rock and Newport	43	75
Krata	31	3 0	5 0	....do	18	25
Roy	24	2 0	2 6	Towing timber to Poplar Bluff	123	....
Welcome	28	2 0	3 0	Jacksonport and Black Rock	30	100
Alma Jane	38	2 0	2 6	Poplar Bluff and Old River	48	....
El Blanco [a]	32	2 6	4 0	....	....	....
Bernice [a]	6	1 4	2 6	....	....	....

[a] No reports received from these boats, they having left the river and their present whereabouts being unknown to this office.

Classification of commerce reported, year ending May 31, 1904.

Articles.	Tons.	Articles.	Tons.
Cotton	895	Railway ties	79,059
Cotton seed	575	Spokes	2,036
Lumber	23,045	Miscellaneous freights	200
Provisions	1,488		
Piles	20,735	Total tonnage reported	191,285
Saw logs	51,645		
Staves and bolts	11,607	Estimated value	$1,092,648

W 7.

IMPROVEMENT OF CURRENT RIVER, ARKANSAS AND MISSOURI.

Operations this fiscal year.—Operations were confined to the operation of and maintenance of snag boats. The snag boat *Riverside* (hand propelled) was at work in this stream at the beginning of the fiscal year, being then at work at Cauhorn Creek, 7 miles above the State line between Arkansas and Missouri. From that point the boat worked upstream to Doniphan Bridge (54 miles above the mouth) and then down to the mouth of Little Black River, which point was reached August 15 and from which it was towed to Black River by the snag boat *Quapaw* the next day.

The snag boat *Quapaw* came into this river the first of August and during that month worked twice over the river below the mouth of Little Black River.

The work accomplished by the two boats is shown in the table below:

Boat.	Work done between—	Distance.	Snags removed.	Drifts broken.	Trees cut.	Miles run.
		Miles.				
Quapaw	Mouth of Current River and mouth of Little Black River.	32	253	3	728	156
Riverside	Mouth of Little Black River and Doniphan Bridge.	22	313	2	134	60
Total	Mouth of Current River and Doniphan Bridge.	54	566	5	862	....

On May 31, 1904, the Secretary of War allotted $2,935 to this river from the appropriation of $200,000 for emergencies in river and harbor works, act of June 13, 1902. The snag boat *Quapaw* will work in this river during the month of September, 1904. As a matter of fact, the river needs and should have more work on it than the one month's work that is to be done by the *Quapaw*, but as the *Riverside* is to be equipped with a new hull, the latter-named boat will not be available for use on Current River during the coming low-water season.

The available balance will be expended in snagging operations.

The amount estimated as being needed for the fiscal year ending June 30, 1906, is for snagging operations which are needed for maintenance of channel.

Money statement.

July 1, 1903, balance unexpended	$3,991.28
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	2,935.00
	6,926.28
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	3,706.12
July 1, 1904, balance unexpended	3,220.16
July 1, 1904, outstanding liabilities	140.82
July 1, 1904, balance available	3,079.34
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	6,750.00

APPROPRIATIONS.

The early examinations of this river were made under appropriations for this in combination with other streams. The independent appropriations for this stream are as follows:

June 2, 1872, Current River, Missouri	$5,000.00
March 3, 1881, Current River, Arkansas and Missouri	2,000.00
August 18, 1894, Current River, Arkansas and Missouri	8,000.00
June 3, 1896, Current River, Arkansas and Missouri	2,000.00
March 3, 1899, Current River, Arkansas and Missouri	5,000.00
June 13, 1902, Current River, Arkansas and Missouri	6,900.00
May 31, 1904, allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	2,935.00
Total	31,835.00
Expended to June 30, 1904	28,614.84
Unexpended July 1, 1904	3,220.16

COMMERCIAL STATISTICS.

There was no steamboat navigation above the mouth of Little Black River during the year. Rafts were run from points all along the stream.

List of vessels that navigated Current River from May 31, 1903, to June 1, 1904.

Name.	Net tonnage.	Draft, loaded.		Between—	Round trip.	Passengers.
		Steamers.	Barges.			
		Ft. in.	*Ft. in.*			
G. W. Huff	66	3 0	4 0	Johnson Landing and points on Black River.	22	220
Alma Jane	38	2 0	2 6	Pocahontas and Johnson Landing	50	
Bernice[a]	6	1 4	2 6	Pocahontas and Little Black River		
El Blanco[a]	32	2 6	4 0	Black Rock and points below Little Black Rock.		

[a] No reports received from these boats, they having left the river, and their present whereabouts being unknown to this office.

Classification of commerce reported, year ending May 31, 1904.

Articles.	Tons.
Staves and bolts	1,317
Provisions	100
Saw logs	43,304
Railway ties	10,852
Total tonnage reported	55,573
Estimated value	$139,199

W 8.

IMPROVEMENT OF ST. FRANCIS AND L'ANGUILLE RIVERS, ARKANSAS.

Operations this fiscal year.—The hand-propelled snag boat *A. B. Johnson* began work at Madison, July 14, worked up to head of Davis bend, 45 miles above Madison and 3 miles below mouth of Tyronza River, then back to Madison, where the boat was laid up October 13. In the 45 miles of river passed over by the *A. B. Johnson* 464 snags were removed and 1,013 trees were cut.

On May 31, 1904, the Secretary of War allotted $4,300 to this river from the appropriation of $200,000 for emergencies in river and harbor works, act of June 13, 1902. This allotment is to be expended in procuring a new hull for the snag boat *A. B. Johnson* and in operating that boat.

The estimate for the improvement of the St. Francis River, Arkansas, is $8,000 annually. The improvement of L'Anguille River from its mouth to the town of Marianna was added to the St. Francis River improvement by the river and harbor act of June 13, 1902, and an appropriation of $9,000 was made for the two streams. A like amount will be needed for the maintenance of the channels of these rivers during the fiscal year ending June 30, 1906.

Money statement.

July 1, 1903, balance unexpended	$4,195.83
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902	4,300.00
	8,495.83
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	3,558.61
July 1, 1904, balance unexpended	4,937.22
July 1, 1904, outstanding liabilities	454.57
July 1, 1904, balance available	4,482.65
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	9,000.00

APPROPRIATIONS.

The earlier examinations and the earlier operations were made under appropriations for these in conjunction with other rivers. Of the expenditures under those appropriations this office has no record.

The separate appropriations are as follows:

March 3, 1871, St. Francis River, Arkansas		$10,000.00
June 14, 1880, St. Francis River, Arkansas		5,000.00
July 5, 1884, St. Francis River, Arkansas		12,000.00
August 5, 1886, St. Francis River, Arkansas		8,000.00
August 11, 1888, St. Francis River, Arkansas		4,000.00
September 19, 1890, St. Francis River, Arkansas		4,000.00
August 18, 1894, St. Francis River, Arkansas		[a] 83,000.00
June 3, 1896, St. Francis River, Arkansas		8,000.00
March 3, 1899, St. Francis River, Arkansas		8,000.00
June 18, 1878, L'Anguille River, Arkansas		10,000.00
March 3, 1879, L'Anguille River, Arkansas		5,000.00
June 14, 1880, L'Anguille River, Arkansas		2,000.00
June 13, 1902, St. Francis and L'Anguille rivers, Arkansas		9,000.00
May 31, 1904, allotted from appropriation for maintenance of river and harbor improvement, act June 13, 1902		4,300.00
Total for St. Francis and L'Anguille rivers, Arkansas		172,300.00
Expended to June 30, 1904:		
Old projects	$84,000.00	
New project	8,362.78	
		92,362.78
Unexpended July 1, 1904		4,937.22

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[a] Seventy-five thousand dollars of appropriation of August 18, 1894, was expended by the Mississippi River Commission for levee construction.

COMMERCIAL STATISTICS.

The river was too low for navigation from September 1, 1903, to December 10, 1903.

List of vessels that navigated St. Francis River, Arkansas, from May 31, 1903, to June 1, 1904.

Name.	Net tonnage.	Draft loaded.		Between—	Round trips.	Passengers.
		Steamer.	Barges.			
		Ft. in.	*Ft. in.*			
Hazel Rice	138	3 6	6 0	Towing saw logs to Helena		
J. D. Butts	12	2 6	2 0	Helena and Ashworth	52	696
Hosmer	52	3 6	6 0	Helena and Black Fish	2	
L. E. Patton	98	4 0	6 0	Memphis and Madison	18	
Maud Kilgore	82	3 6	6 0	Helena and Sand Slough	41	
Mary F. Carter	50	2 6		Helena and Madison Helena and Marianna		

Classification of commerce reported, year ending May 31, 1904.

Articles.	Tons.	Articles.	Tons.
Cotton	423	Railway ties	3,675
Cotton seed	810	Miscellaneous	162
Grain	300		
Lumber	2,100	Total tonnage reported	119,172
Provisions	900		
Saw logs	110,802	Estimated value	$423,469

W 9.

IMPROVEMENT OF ST. FRANCIS RIVER, MISSOURI.

Operations this fiscal year.—A chopping party with a snagging barge was at work in the vicinity of Roark Creek, 14 miles above St. Francis town, at the beginning of this fiscal year. The party worked downstream to within 5 miles of Kennett, Mo., when operations were closed September 2 on account of the fund then available not being sufficient to work the outfit through the drift jams in and near Dunklin County Cut-off. After the cessation of operations the outfit was cared for by a watchman.

In the 35 miles of river worked over by the chopping party 219 snags were removed, 64 small drifts broken up, 336 trees cut, 134 trees deadened, overhanging limbs cut from 82 trees, and a channel 30 feet wide opened through 9 drift jams. These drift jams varied in length from 80 to 1,200 feet and occurred in the 6 miles of river lying on the north side of Seven Mile Island. The working party was a month opening the narrow channel through these jams, and in doing so removed 1,158 snags and logs.

Acting under authority granted by the Secretary of War June 7, 1904, the movable property used on this work was shipped to Batesville, Ark., in June, and the floating property, i. e., the barge and scows, were sold at public auction June 25, 1904.

For the reasons given in my last annual report (p. 1493) no further appropriations are recommended for this stream.

Money statement.

July 1, 1903, balance unexpended		$3,676.36
June 30, 1904, amount expended during fiscal year:		
For maintenance of improvement	$3,582.26	
Less sale and refundment	80.36	
		3,501.96
July 1, 1904, balance unexpended		174.40
July 1, 1904, outstanding liabilities		143.94
July 1, 1904, balance available		30.46

APPROPRIATIONS.

This reach of river is understood not to have been included in the snagging operations under the early appropriations for snagging in Western rivers. Its specific appropriations are as follows:

August 11, 1888	$5,000.00
September 19, 1890	10,500.00
August 18, 1894	5,000.00
June 13, 1902	10,000.00
Total	30,500.00
Expended to June 30, 1904	30,325.60
Unexpended July 1, 1904	174.40

COMMERCIAL STATISTICS.

No steamboat navigated this river during the year. A small unregistered gasoline boat navigated the stream, but no report of the business done by it has been received, although repeated inquiry has been made. The rafted commerce amounted to 7,044 tons, having an estimated value of $14,088.

W 10.

PRELIMINARY EXAMINATION AND SURVEY OF LITTLE RED RIVER, ARKANSAS, FROM ITS MOUTH TO AND INCLUDING THE GOVERNMENT QUARRIES AT BEE ROCK.

[Printed in House Doc. No. 205, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith reports dated January 13 and May 6, 1903, by Capt. Graham D. Fitch, Corps of Engineers, on preliminary examination and survey, respectively, of Little Red River, Arkansas, from its mouth to and including the Government quarries at Bee Rock, authorized by the river and harbor act of June 13, 1902.

Captain Fitch presents a plan for improvement by cutting overhanging timber from the banks, removing snags from the channel, and removal of loose rocks and bowlders, at an estimated cost of $3,000, if made available by one appropriation.

In the opinion of Captain Fitch, concurred in by the division engineer, and by the Board of Engineers for Rivers and Harbors, which has reviewed this report under the provisions of sections 3 and 14 of the above-mentioned act, the locality is worthy of improvement to this extent. I concur in this opinion.

The work on Little Red River would be for the purpose of facilitating handling stone used in the Mississippi River improvement, and the expense may properly be provided for in an appropriation for the latter work.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

PRELIMINARY EXAMINATION OF LITTLE RED RIVER, ARKANSAS, FROM ITS MOUTH TO AND INCLUDING THE GOVERNMENT QUARRIES AT BEE ROCK.

ENGINEER OFFICE, UNITED STATES ARMY,
Little Rock, Ark., January 13, 1903.

GENERAL: I have the honor to acknowledge the receipt of your communication of the 30th ultimo, informing me that my report on preliminary examination of Little Red River, Arkansas, act of June 13, 1902, had not been received by you. * * *

Three examinations of Little Red River have been made. The reports are published in Annual Reports of the Chief of Engineers as follows: 1871, page 362; 1882, page 1587, and 1885, page 1612. Another examination, although desirable for the purpose of accurately determining the minimum discharge and maximum fall at the shoals, is not necessary in order to prepare the report called for upon "Little Red River, from its mouth to and including the Government quarries at Bee Rock."

The river is divided by nature into two distinct sections, one being of the nature of a bayou, the other that of a mountain stream. The bayou section extends from White River (of which the Little Red River is a tributary) to near Judsonia, a distance of about 25 miles. In this section the average controlling depth at lowest water is approximately 4 feet, excepting at a sandy shoal, 8 miles above the mouth, where the low-water depth is about 1½ feet, and at Bess shoals, 22 miles above the mouth, where the low-water depth is only about 6 inches. Either or both of these shoals can probably be dredged to give a minimum low-water depth of 2.5 feet over them, making that the minimum depth between White River and Judsonia shoals, near the town of Judsonia.

Between the foot of Judsonia shoals and the Government quarries the character of the river is different. The shoals become longer and more frequent, the pools between them shorter, and the difference in elevation between pool levels greater. The low-water discharge of the stream is thought not much to exceed 100 cubic feet a second, and the average slope of the stream is so great that dredging a navigable channel through the shoals would simply drain the pools and make the entire distance shoal. The Judsonian shoals, the most formidable of all, are in reality two shoals separated by a shallow pool about 1 mile long. The lower shoal, which can be crossed dry shod in periods of lowest water, is about 600 feet long and has a fall of approximately 2.3 feet. A lock and dam will be required to obtain all the year round navigation over this shoal. The pool formed by this dam would probably drown out all the shoals between Judsonia and the Government quarries.

The commerce on Little Red River is not large. One small steamboat is engaged in towing saw logs and rough mill stock from points on White River to a sawmill at Judsonia whenever the Little Red is at stages giving 3 or more feet over Bess shoals. This commerce will not vary much from 5,000 tons annually. Report has been made that when White River is up to 15-foot stage 4-foot navigation is possible to the Government quarries. Stages giving that depth do not occur at regular intervals, and their duration varies from nothing to five months in a year. During these high stages the Mississippi River Commission obtains from the Government quarries some of the stone needed for work on that river, and in the fiscal year ending June 30, 1894, towed 50,700 tons of stone from there. I understand this to be the largest quantity taken out in any one year. Neglecting the stone towed by the Mississippi River Commission, the only commerce on Little Red above Judsonia is that of rafting saw logs and railway ties, which is approximately 10,000 tons annually.

It is my opinion that the commerce of Little Red River is not sufficient to warrant at this time any improvement beyond the removal of overhanging timber, of snags, and of bowlders that project above the general plane of the shoals. A survey is not needed for making a project and estimate for this work.

Very respectfully, your obedient servant,

GRAHAM D. FITCH,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

WESTERN DIVISION, OFFICE OF DIVISION ENGINEER,
St. Louis, Mo., January 16, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army, concurring in the opinion of Captain Fitch.

AMOS STICKNEY,
Colonel of Engineers,
Division Engineer, Western Division.

[Second indorsement.]

OFFICE OF THE CHIEF OF ENGINEERS, U. S. ARMY,
February 7, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., April 15, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given due consideration to the within report of the district officer, the indorsement of the division engineer thereon, and other data at hand.

The miscellaneous commerce of "Little Red River, from its mouth to and including the Government quarries at Bee Rock," is very small and local in character, but a considerable use of the river has been made by the Mississippi River Commission for the transportation during high stages of stone needed for the improvement of the Mississippi River. In one year over 50,000 tons of stone have been taken from Little Red River upon Government barges, and there is prospect that such use of the river will continue. The district officer states that a project and estimate for an improvement of the high-water channel, by the removal of snags and bowlders, may be made without a formal survey.

The Board is of opinion that a limited improvement of this river by the General Government, of the character contemplated by the district officer, is advisable, provided such improvement can be effected at reasonable cost, and recommends that the district officer be directed to prepare a project and estimate.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
April 22, 1903.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Little Red River, Arkansas, authorized by the river and harbor act approved June 13, 1902.

Inviting attention to the report of the Board of Engineers for Rivers and Harbors in the preceding indorsement, I recommend that a project and estimate of cost of improvement of the locality as proposed be authorized.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

[Fifth indorsement.]

WAR DEPARTMENT,
April 24, 1903.

Approved as recommended by the Chief of Engineers.

By order of the Secretary of War:

JOHN C. SCOFIELD,
Chief Clerk.

[Sixth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
May 14, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with project and estimate as recommended.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Seventh indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., June 6, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the accompanying project and estimate in connection with previous report upon a preliminary examination of "Little Red River, from its mouth to and including the Government quarries at Bee Rock," Arkansas.

The district officer estimates the cost of the proposed improvement at $3,000 and expresses the opinion that the present and prospective commerce will justify the improvement outlined in his report. Inviting attention to its previous report on the preliminary examination of this locality, the Board now believes that the cost of the proposed limited improvement is reasonable, and concurs in the opinion of the district officer that the work is justifiable.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

PLAN AND ESTIMATE OF COST OF IMPROVING LITTLE RED RIVER, ARKANSAS, FROM ITS MOUTH TO AND INCLUDING THE GOVERNMENT QUARRIES AT BEE ROCK.

ENGINEER OFFICE, UNITED STATES ARMY,
Little Rock, Ark., May 6, 1903.

GENERAL: In compliance with instructions contained in letter from your office dated April 30, 1903, I have the honor to submit the following project and estimate for the improvement of "Little Red River [Arkansas], from its mouth to and including the Government quarries at Bee Rock."

It is proposed to cut the overhanging timber from the banks; to remove the snags from the channel by cutting them off with saws or by using dynamite, and to improve the channel over the shoals by removing loose rocks and bowlders, the work to be done by a force of laborers quartered on lightly built boats to be abandoned upon the completion of the work.

The estimated cost is $3,000, based on the assumption that this amount be made available by one appropriation.

It is my opinion that the present and prospective commerce justifies the improvement outlined above. It is also my opinion that if this work be done in one season it will meet the demands of commerce for several years.

Very respectfully, your obedient servant,

GRAHAM D. FITCH,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., May 8, 1903.

Respectfully forwarded to the Chief of Engineers, United States Army.

In view of the facts presented in the report on the preliminary examination, dated January 13, 1903, it is believed that "Little Red River [Arkansas], from its mouth to and including the Government quarries at Bee Rock," is worthy of improvement to the extent indicated within by Captain Fitch, and the project submitted is recommended for approval.

H. M. ADAMS,
Lieut. Col., Corps of Engineers,
Division Engineer.

APPENDIX X.

REMOVING SNAGS AND WRECKS FROM MISSISSIPPI RIVER; IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN THE OHIO AND MISSOURI RIVERS.

REPORT OF MAJ. THOS. L. CASEY, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Removing snags and wrecks from the Mississippi River below the mouth of the Misssouri River.
2. Mississippi River between the Ohio and Missouri rivers.

EXAMINATION.

3. Missouri Chute, Mississippi River, Missouri.

ENGINEER OFFICE, UNITED STATES ARMY,
St. Louis, Mo., July 18, 1904.

GENERAL: I have the honor to transmit herewith the annual report for the works under my charge for the fiscal year ending June 30, 1904.

Very respectfully, your obedient servant,

THOS. L. CASEY,
Major, Corps of Engineers.

Brig. Gen. A. MACKENZIE,
Chief of Engineers, U. S. A.

X 1.

REMOVING SNAGS AND WRECKS FROM THE MISSISSIPPI RIVER BELOW THE MOUTH OF THE MISSOURI RIVER.

A concise statement of the project for and history of this work will be found in the Annual Report of the Chief of Engineers, United States Army, to which this is an appendix, as well as on page 2621 of the Report of the Chief of Engineers, United States Army, for 1900.

This work is now being done through the instrumentality of two large steel-hulled snag boats, *H. G. Wright* and *J. N. Macomb*, fitted with all necessary tools and appliances and operated by hired men. They patrol the river between the mouth of the Missouri River and Natchez, Miss., going occasionally as far down as New Orleans, La.

OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1904.

During the year the snag boats patrolled the parts of the river assigned to them—the *H. G. Wright* between the mouth of the Missouri River and Memphis, Tenn., and the *J. N. Macomb* between Memphis, Tenn., and Natchez, Miss.—and removed snags, wrecks, drift piles, and leaning trees wherever required, until the spring rise of the river about the middle of March, 1904, when they were laid up with reduced crews for the ordinary annual repairs—the *Wright* at St. Louis, Mo., and the *Macomb* at Memphis, Tenn. The high stage of the river that prevailed thereafter being unfavorable for removing snags and obstructions, the boats remained at the respective places until the end of the fiscal year.

A summary of the work accomplished by the two boats during the year is found in the following table:

Name.	Snags pulled.	Trees cut.	Drift piles removed.	Miles run.
J. N. Macomb	2,873	9,302	17	8,644
H. G. Wright	1,781	7,732	1	8,675
Total	4,654	17,034	18	17,319

In addition to the above the *Wright*, on December 3, 1903, removed the shaft of the steamer *City of Sheffield*, which burned at Grand Tower, Ill., in October, 1902, and was an obstruction to the landing at that place, and on December 14 to 16, removed the wreck of a coal barge sunk at Presidents Island, near Memphis, Tenn. On January 26 to 27, 1904, the *Macomb* worked on the wreck of the steamer *Emma Etheridge*, at Greenville, Miss., and removed three boilers and such parts of the wreck as could be secured. On account of a sudden rise of the river the work was discontinued until a more favorable stage occurs for completing the work.

The trees referred to are generally leaning timber in bends of the river or trees that are liable to fall into the water and become obstructions to navigation.

An annual appropriation of an amount not to exceed $100,000 having been made for this work, the snag boats will patrol the river whenever necessary in order to keep the channel free from obstructions, such as logs, drift jams, leaning trees, and such wrecks as they may be able with their appliances to remove after the same have been blown to pieces with explosives.

EXPENDITURES.

The amount expended on this work to July 1, 1904, under all specific appropriations since and to include March, 1879, is $1,877,722.59.

Amount expended from current allotment during the fiscal year, $88,245.25. A statement of this expenditure, as required by law, is given in the accompanying table.

The work done by the snag boats is of great benefit to the commerce and navigation on the river. Before the river was so completely patrolled as it now is the sinking of steamboats and other river craft by running on snags was a common occurrence. During recent years such disasters seldom occur. Although life and property would seem to be much safer now than formerly, the rate of insurance has not materially decreased.

It is proposed during the coming year to continue operating these snag boats, as provided in the river and harbor act of August 11, 1888.

The statistics relating to the commerce benefited by the operation of these snag boats will be found in the report of operations for this year for the improvement of the Mississippi River from the mouth of the Missouri to the mouth of the Ohio River.

The headquarters of the snag boats is in St. Louis.

The amount of customs collected at St. Louis during the fiscal year was $2,376,195.02.

The amount of internal revenue collected was $8,047,858.42.

Money statement.

Amount drawn under section 7, act of August 11, 1888	$88, 245. 25
June 30, 1904, amount expended during fiscal year	88, 245. 25
July 1, 1904, amount available for fiscal year 1904–5	100, 000. 00

ALLOTMENTS.

By act of—		Fiscal year ending June 30—	
March 3, 1879	$100, 000. 00	1895	$100, 000. 00
June 14, 1880	100, 000. 00	1896	80, 496. 26
March 3, 1881	80, 000. 00	1897	83, 421. 64
March 2, 1882	85, 000. 00	1898	88, 917. 74
July 5, 1884	72, 950. 63	1899	88, 923. 15
August 5, 1886	56, 250. 00	1900	86, 355. 29
August 11, 1888	100, 000. 00	1901	86, 710. 05
Fiscal year ending June 30—		1902	93, 055. 27
1890	49, 089. 17	1903	72, 587. 48
1891	92, 720. 97	1904	88, 245. 25
1892	98, 250. 00		
1893	96, 497. 23	Total	1, 877, 722. 59
1894	88, 252. 46		

TABLE No. 1.—*Summary of expenses for operating U. S. snag boats H. G. Wright and J. N. Macomb in connection with the work of removing obstructions in Mississippi River during the fiscal year ending June 30, 1904.*

Application.	1903.				
	July.	August.	September.	October.	November.
Office expenses		$1,002.35	$6.20	$815.95	$10.65
Expenses of snag boat H. G. Wright:					
Crew	$2,037.50	2,091.49	2,045.83	2,115.34	(*a*)
Outfit	11.69				
Fuel	270.00	662.25	614.20	1,258.33	512.25
Subsistence	418.25	24.07	632.60	705.40	117.31
Supplies			3.75		
Repairs	35.67		29.02	38.10	
Expenses of snag boat J. N. Macomb:					
Crew	1,808.67	2,104.00	2,110.00	2,090.50	
Outfit	15.35	16.35			
Fuel	492.09	735.00	1,276.25	1,932.50	665.00
Subsistence	767.48	489.00	337.35	468.49	901.72
Supplies		25.75			
Repairs	30.30				
Total	5,887.00	7,150.26	7,055.20	9,424.61	2,206.93

Application.	1903.	1904.			
	December.	January.	February.	March.	April.
Office expenses	$3.35	$4.95	$4.64	$936.30	$939.48
Expenses of snag boat H. G. Wright:					
Crew	*a* 4,115.67	424.16	3,747.83	1,988.01	1,404.00
Fuel	1,105.55	1,394.35	824.40	337.50	311.40
Subsistence	744.94	352.28	791.35	103.35	676.29
Supplies		185.50			
Expenses of snag boat J. N. Macomb:					
Crew	4,127.83	2,124.00	2,099.83	1,737.00	1,475.00
Outfit	220.26				130.00
Fuel	1,425.25	1,072.95	1,616.51	447.50	520.00
Subsistence	333.19	139.27	663.44	92.41	589.52
Supplies		25.92	45.00		
Repairs	5.00				
Miscellaneous					25.85
Total	12,081.04	5,723.38	9,793.00	5,642.07	6,071.54

Application.	1904.		Total.
	May.	June.	
Office expenses	$20.90	$958.44	$4,703.21
Expenses of snag boat H. G. Wright:			
Crew	1,432.00	1,440.00	22,841.83
Outfit	673.92	7.00	692.61
Fuel	276.82	150.00	7,717.05
Subsistence	318.14	324.63	5,208.61
Supplies	501.60	49.51	740.36
Repairs	1,640.64	358.62	2,102.05
Expenses of snag boat J. N. Macomb:			
Crew	1,738.50	1,569.17	22,984.50
Outfit	230.28	1,460.77	2,073.01
Fuel	194.25	474.00	10,851.30
Subsistence	186.85	404.69	5,373.41
Supplies	413.96	57.18	567.81
Repairs	993.53	1,286.27	2,315.10
Miscellaneous		48.55	74.40
Total	8,621.39	8,588.83	88,245.25

a Crew for November services paid in December accounts.

X 2.

IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN OHIO AND MISSOURI RIVERS.

A concise statement of the project for and history of this work will be found in the Annual Report of the Chief of Engineers for 1904, page 412, as well as on page 2631 of the Report of the Chief of Engineers, United States Army, for 1900.

Reference should be made to the Report of the Chief of Engineers, United States Army, for 1894, pages 1577 et seq., for information relating to the development of the various forms of construction and for a résumé of the various types employed between 1872 and 1894, and to the Reports of the Chief of Engineers, United States Army, for 1895 (p. 2059), 1896 (p. 1717), 1897 (p. 2012), 1898 (p. 1698), 1900 (p. 2632), and 1901 (p. 2169) for minor details as to forms of construction.

Since the adoption of this project work has been done substantially according to the methods referred to above at the following localities: Mouth Missouri River, St. Louis Harbor, Cahokia Chute, Arsenal Island, Horsetail Bar, Carroll Island, Twin Hollows, Pulltight, Beards Island, Chesley Island, Jim Smiths, Sulphur Springs, Foster Island, Lucas, Cornice Island, Rush Tower, Michaels Landing, Danby Landing, Rush Towhead, Penitentiary Point, Turkey Island, Ste. Genevieve, Kaskaskia Island, Chester, Crain Island, Liberty Island, Seventy-six Landing, Willard, Hamburg, Devils Island, Minton Point, Cape Girardeau, Commerce Island, Burnham Island, Powers Island, Goose Island, Buffalo Island, Greenleaf Bend, Hurricane Field, Greenfield Bend, and vicinity of Cairo.

During the fiscal year ending June 30, 1904, work for the permanent improvement of the river has been carried on, as hereinafter described, at the following localities: Opposite Missouri River, Pulltight, Chesley Island, Danby Landing, Penitentiary Point, Ste. Genevieve, Chester, Crain Island, Liberty, Liberty Bend, Willard, Goose Island, Buffalo Island, Greenleaf Bend, Hurricane Field, and Greenfield Bend. (See Pls. 1 and 2.)

PERMANENT IMPROVEMENT.

Opposite mouth of Missouri River (*15 miles above St. Louis*).—In 1899 and 1900 the Illinois bank opposite the mouth of the Missouri River was protected below the plane of low water with a lumber mattress for 11,025 feet. Above the shore edge of the mattress the bank slope was revetted with stone to the levels of river stages varying from 5 feet to 20 feet on the St. Louis gauge, the latter height being about the top of the bank for 10,000 feet of the protection.

The old revetment, which was found in fair condition, was thoroughly repaired and raised to the top of the bank for its full length. The mattress was extended 2,745 feet. The bank along the new mattress is much higher than along the old work, and for 1,500 feet at its upper end was graded by the action of the river to a suitable slope for the reception of stone as high as the 21-foot level. This portion of the bank was also fully revetted, so that the completed protection is now 12,500 feet in length, the mattress alone extending 1,270 feet farther, with a nearly vertical bank above it.

Pulltight, Illinois (15 miles below St. Louis).—The accretions gained by the hurdles, built 1882, 1883, 1884, 1889, 1893, 1894, and 1895 at this locality have so suffered from erosion during the last three years that the new bank of the river has receded a maximum distance of about 700 feet, the cutting beginning at the main shore above the hurdle system and extending in varying amounts to the outer end of hurdle No. 7 near the foot of Beard Island, and destroying the outer ends of the upper hurdles so that a channel of the river ran across them, leaving to the west the buttresses of Nos. 1 and 2, which, when built, were at the east channel limit. In order to restore the former bank and channel conditions, it was decided to rebuild the hurdles gradually, either directly upon the old lines or by spurs located between the latter and extending from the present bank to the channel limit line. One such hurdle was built lying between Nos. ¼ and ½, thus being serially No. ⅜. It is 860 feet in length and is fully completed with buttress and T-head at its outer end. Another hurdle, No. 1, about 2,000 feet farther downstream, was begun June 6, and was nearly completed at the end of the year. Other lines of the same character will be built as local conditions indicate their necessity.

Chesley Island, Missouri (19 miles below St. Louis).—The original hurdles (1883, 1884, and 1885) closing the chute between this island and the Missouri shore having been almost destroyed by fire, ice, and drift, allowing a considerable volume of water with strong current (13 feet depth—St. Louis gauge, 20 feet) to pass through, it was decided to close the chute again with a new hurdle dam 250 feet in length, located 1,250 feet below the former hurdles, or about one-third mile below the head of the island. On account of the soft character of the bottom the foundation for this dam was laid with a double thickness of mattress along the piling line. After the completion of the hurdle a rise in the river lodged above it a large mass of drift, which was promptly sunk, adding greatly to the strength and effectiveness of the dam.

The revetment at the head and on the east face of the island has suffered seriously from erosion during the last two years. It was repaired during the first half of this fiscal year, but the spring flood caused an erosion which will require new protection on a considerable length of bank. This has not yet been begun.

Danby Landing, Missouri (40 miles below St. Louis).—Several small breaks and slides in this revetment, which were developed this season by the falling river, were repaired. Their aggregate length was about 600 feet, but they were scattered along 3,000 feet of the protection.

Penitentiary Point, Illinois (42 miles below St. Louis).—About 6,350 feet of this bank, beginning a quarter of a mile below the mouth of Salt Bend Slough, was protected in 1901 with a mattress and partially with stone, the bank above being then too steep for the completion of the latter part of the revetment.

During the last two high waters the work was badly damaged and its efficiency destroyed in its lower half by deep erosion of the bank, which left the new shore line from 400 feet to 600 feet behind its former location. The mattress was extended upstream 1,250 feet to the slough and downstream 4,225 feet along the newly eroded bank, making the entire length of partially protected bank now 7,600 feet. The stonework was carried to the top of the bank, fully completing the revetment for about 4,500 feet at its upper end, and for the remaining distance to the top of the natural bank slope, at about the level of a 15-foot stage.

Ste. Genevieve, Mo. (60 miles below St. Louis).—This protection was placed 1897–1901. The original length was 7,350 feet downstream from hurdle No. 18, but by wear at the lower end and cutting into the bank behind the mattress it has been shortened in recent years to about 6,000 feet of complete protection, the lower levels of the revetment beyond this running gradually out into the river, at stages above mean low water, until the end of the mattress is 250 feet from the bank.

During the last few seasons the channel has been close to the revetted bank, crowded against it by a middle bar, causing numerous slips in the stonework and several circular caves in the bank. The stonework was thoroughly repaired and raised nearly to the top of the bank, and short sections of mattress were placed in the caves. In one of the largest of these a spur hurdle was built to break the eddy there encountered. With these repairs and additions the protection is now fully completed for 6,000 feet from hurdle No. 18. For the remaining distance (1,350 feet) the mattress is in place and the stonework is exposed at low stages, both, however, detached from the bank, as has been said. To prevent further erosion and damage to this section a short hurdle, No. 24, about 175 feet in length, was built at a point 6,900 feet below No. 18, connecting the new bank with the old revetment; it is thought that this will restore the bank line eventually to its former location.

The lower end of this revetment was damaged during the spring flood and was repaired.

On the approach of low water, early in August, the crossing between the Missouri shore at the foot of the revetment and the mouth of Kaskaskia River threatened to become shoal and an obstruction to navigation. To correct this tendency a hurdle, No. 25, was built from the Missouri shore at a point about 600 feet below the revetment just referred to, projecting 1,575 feet into the river and forcing the channel to the Illinois shore near the mouth of the Kaskaskia, where it maintained a good depth throughout the year.

The hurdle was very strongly built with T-head and buttress at the outer end, and, for 900 feet of its length from shore, heavy drift which had accumulated above it was sunk, adding much to its strength.

The April flood, however, passed over the soft bank at the root of this hurdle and cut it away without damaging the structure, until the latter was entirely detached and about 400 feet distant from the new bank. As the depths found on the original line of the hurdle across the newly scoured channel were excessive, the hurdle was connected anew to the bank by an addition built diagonally upstream from its inner end, 450 feet, to the wooded shore, which was there revetted with a lumber mattress and stone.

Chester, Mo. (Horse Island, 69 miles below St. Louis).—This protection was placed in 1897–98. It is 4,346 feet long, but only the upstream third of its length was in good condition at the beginning of the present season, the remainder of the bank above the mattress having suffered much from erosion. At the upper end of the latter stretch about 1,650 feet of the subaqueous protection was replaced and several pocket mattresses were sunk in the caves where the erosion had been most irregular.

Crain Island, Missouri (72 miles below St. Louis).—The main chute (known as Missouri Chute) between the Missouri shore and Puckett Island, and the small chute between the latter and Crain Island, were closed in the spring by the construction of two hurdle dams, 1,400 feet and 375 feet in length, respectively.

These hurdles were in moderate depths of water and in consequence were more lightly built than usual, the piling being in two rows of 3-pile clumps spaced 8 feet apart and driven through double-tier foundation mattresses of lumber. The hurdles were curtained to the level of a 25-foot stage.

During the high water in May the erosion of the head of Crain Island became a menace to the smaller dam. To stop the erosion the protection of the head of Crain Island was begun, but, on account of the high stage of river, was not carried further than to effect the object in view. The bank was protected with a mattress and stone revetment for 1,519 feet. As the depths were not very great, although the current was swift and destructive to the bank, the mattress used was narrow, 75 feet to 90 feet in width, and its shore edge was sunk at about the contour of the 15-foot stage. Between this level and the water edge the bank was loosely coated with spalls and stone, to be rearranged when exposed at lower stages; thence to the 30-foot contour the bank was graded and paved with stone in the usual manner.

Liberty, Mo., below Anchor Landing (77 miles below St. Louis).—The shore hurdles between Crain Island and Bishop Point, work upon which had been interrupted by the high water of June, 1903, were completed. The aggregate length added to them during the year is 650 linear feet, and their separate completed lengths are now as follows: No. 1½, 275 feet; No. 6½, 200 feet; No. 8, 450 feet; No. 9, 350 feet; No. 10, 400 feet; No. 11, 200 feet; No. 12, 225 feet, and No. 13, 225 feet, making a total length of 2,325 feet. The ends of these lines slope from a 25-foot stage to a 15-foot stage, the outer piles in hurdles Nos. 8 to 13, inclusive, resting in the stonework of the old revetment.

Liberty, Mo., below Bishop Landing (80 miles below St. Louis).—Hurdles Nos. 7 and 10 of this system were broken several years ago, but the chutes leading to them have been too shoal, except at extreme high water, to permit their repair until this season. Hurdle No. 7, which was broken next the shore, was repaired by the construction of a shore revetment and 525 feet of new hurdle line on a line inclining upstream from the original location and following the shoalest water in the vicinity. Hurdle No. 10 was broken about 1,000 feet from shore, and the repair consisted of 725 feet of new hurdle running somewhat upstream and around the gap in the line, again following the shoalest water. The old piling, in both hurdles, was reenforced and strengthened with new piles where necessary and accessible.

Liberty Bend, Illinois (81 miles below St. Louis).—The entire length of subaqueous protection laid along this bank is 13,425 feet. Upon the upper 11,000 feet the stonework had been laid as high as the

20-foot to 25-foot levels. For the remaining distance, 2,325 feet, stone had not been placed above the 14-foot stage, but by the action of the river was at the beginning of the year about 2 feet lower, although the bank above it showed very little wear. The stonework was repaired and raised to the high bank at levels from 28 feet to 30 feet along the first section, which, therefore, may be considered completed. The second section should be completed at the earliest opportunity.

Willard, Ill. (111 miles below St. Louis).—A hurdle was begun at this locality during June and was in process of construction at the close of the fiscal year, a part only of the foundation having been laid. The hurdle will probably be completed early in the ensuing season.

Goose Island, Illinois (145 miles below St. Louis).—The channel in the vicinity of Anita Towhead having been shoal and difficult for two seasons, requiring dredging, it was decided to extend the Goose Island system of hurdles by the construction of line No. 14, projecting from the bank at Commercial Point, to concentrate the flow. The hurdle was completed with T-head and buttress early in the year, and is 1,520 feet in length.

Buffalo Island, Missouri (148 miles below St. Louis).—When the first work in this locality, 5,000 feet of mattress and partially completed stonework above it, was placed, in 1900, along the foot of Anita Towhead, Griffith Island and Philadelphia Point, about 4 miles of protection in all were contemplated. Since that time the erosion has been greatest from Price Landing to 1 mile below the head of Buffalo Island, with maximum recession of the bank of 1,000 feet (since survey, 1899), near Elkin Landing. The bight of the bend thus has been moved downstream about half a mile, which will necessitate an extension of the contemplated protection to a length of 5½ miles.

Two sections of mattress, 2,285 feet and 1,880 feet long, respectively, spaced 2,885 feet apart, were placed, beginning, respectively, 400 feet above Price Landing and 600 feet below the head of Buffalo Island. The shore edges of these mattresses were secured with stone and spalls, and the bank above the first section was revetted to the top of the natural slope at the levels of 12-foot to 15-foot stages, and about 180 feet in the second section had been revetted to the 13-foot stage, when work was stopped by cold weather.

Greenleaf Bend, Illinois (161 miles below St. Louis).—The works previously placed in this vicinity at Greenleaf Bend and Beach Ridge are both included in the above caption. The original lengths of these sections were 6,075 feet and 9,435 feet, respectively. Both had suffered slight losses at their lower ends, but this year these losses were restored and the mattresses were extended in lengths to 7,575 feet and 10,430 feet, lying 3,200 feet apart.

To prevent the usual formation of eddies against the unprotected bank immediately below the ends of these works, short spur hurdles of piling were built across the mattresses, 175 feet and 300 feet from their lower ends, the eddies formed under the spurs thus falling upon the mattresses, which are able to resist them. The stonework was thoroughly repaired and raised to the high-water line wherever necessary, and was extended along the new mattresses to the top of the natural bank slope. At the close of the year the upper section of the work was completed to the high-water line at the levels of 30-foot stage for 4,600 feet, and was 3 to 9 feet lower for the remainder of its length. The lower section was completed to the 30-foot stage for 9,000 feet, and was 2 to 12 feet lower for the remaining distance.

Hurricane Field, Missouri (*165 miles below St. Louis*).—A protection of this rapidly caving bend was begun. The mattress was laid with considerable difficulty along 5,060 feet of the bank. Its shore edge, at the level of a 12-foot stage, was secured with stone and spalls, and along 3,000 feet of the bank at the upstream end of the work the revetment was carried from 6 to 16 feet higher, to the top of the naturally graded bank slope.

Greenfield Bend, Missouri (*172 miles below St. Louis*).—For the protection of the bank at this locality considerable expenditures have been already made at and above Bird Point by the railroads terminating there. A part of this work has been destroyed by the river cutting behind it, leaving portions of the stonework detached from the bank to menace navigation should the bank be allowed to recede farther. A protection for the bank and short-spur hurdles to connect these stone piles with it were designed, but by reason of the high stages of river and consequent great depths found, the construction of the hurdles was not attempted. The bank, however, was protected by a mattress for 1,925 feet immediately above the fascine work of the railroads and along it the stonework was carried to the top of the natural bank slope at the levels of stages varying from 12 to 18 feet. To secure the head of the work a short-spur hurdle was built across the mattress 100 feet below its upstream end.

TEMPORARY EXPEDIENTS.

The only dredging or other temporary expedients carried on during the year was at Okaw crossing, from the foot of Ste. Genevieve Bend to mouth of the Okaw River, where the wheels of the towboats *Gen. H. L. Abbot* and *T. L. Casey* were used. The unusually high stage of the river rendered other dredging unnecessary.

Buoys were placed on all crossings which threatened to become shoal.

PLANT.

The plant belonging to this improvement was repaired and necessary additions were made to maintain its efficiency. New hulls were built for tenders *Nos. 6* and *7*, and each was equipped with a fire pump and steam capstan. Six barges, 1 office and survey boat, 5 pile drivers, and 1 derrick boat were extensively repaired on the ways at the engineer depot, and 8 steel flats, begun the preceding year, were completed. A new machine shop was built and equipped with boilers taken from the condemned steamer *Gen. Gillmore*, the engines from condemned pile drivers, and the material used was taken largely from that on hand which had become unserviceable for the purposes for which it was purchased.

MATERIAL.

The piles, lumber, and part of the stone required for the construction works were procured by contract; the remainder of the stone was procured by hired labor and payment of royalty at Little Rock quarries, near Ste. Genevieve, Mo.

PHYSICAL DATA.

The gauges established along this reach of the river were read and repaired as required.

Measurements of the discharge of the river were made with full-depth rod floats at stages 25 feet and under at the engineer depot, and at higher stages at Chester, Ill. The results of these measurements are shown in the following table, which is in continuance of the table published in the Annual Report of the Chief of Engineers for 1901, pages 2206 et seq.

Measurements of discharge of the Mississippi River, 1903–4.

Date.	Localities.	St. Louis gauge, 0=166.26 feet above St. Louis datum.	Elevations of water surface above St. Louis datum.		Oscillations.	Width of waterway.	Area of entire cross section.	Mean depth.	Elevations of mean bottom above St. Louis datum.	Total volume of discharge.	Mean velocity.	Number of stations.	Method.
			St. Louis gauge.	Local gauge.									
1903.						*Feet.*	*Sq. feet.*	*Feet.*	*Feet.*	*Cu. feet per sec.*	*Feet per second.*		
July 2	Foot of Arsenal street, St. Louis, Mo	20.7	186.9	185.5	F.	2,559	64,959	25.4	160.1	287,732	4.43	13	Rod floats.
6	.....do	17.5	183.8	182.6	F.	2,540	55,668	21.9	160.7	228,592	4.11	14	Do.
8	.....do	17.0	183.3	182.1	S.	2,536	54,820	21.6	160.5	215,348	3.93	12	Do.
11	.....do	16.9	183.2	182.2	F.	2,536	55,165	21.8	160.4	215,938	3.91	13	Do.
13	.....do	16.0	182.3	181.2	F.	2,485	52,903	21.3	159.9	202,450	3.83	14	Do.
15	.....do	16.0	182.2	181.2	R.	2,484	51,473	20.7	160.4	200,580	3.80	14	Do.
17	.....do	18.3	184.5	183.3	R.	2,522	60,152	23.9	159.5	246,062	4.10	15	Do.
20	.....do	19.4	185.7	184.5	F.	2,529	62,175	24.6	159.9	262,059	4.21	15	Do.
22	.....do	18.9	185.2	183.9	R.	2,526	60,921	24.1	159.8	244,901	4.02	15	Do.
24	.....do	19.2	185.5	184.3	R.	2,529	60,982	24.1	160.2	255,537	4.19	15	Do.
27	.....do	20.6	186.9	185.6	F.	2,549	66,084	25.9	159.7	282,920	4.28	15	Do.
31	.....do	17.7	184.0	182.8	F.	2,499	56,618	22.7	160.2	220,318	3.89	15	Do.
Aug. 3	.....do	15.8	182.0	180.9	R.	2,486	52,480	21.1	159.8	193,956	3.70	14	Do.
5	.....do	14.9	181.2	179.9	F.	2,484	48,340	19.5	160.5	174,771	3.62	15	Do.
13	.....do	17.2	183.4	182.4	S.	2,509	55,281	22.0	160.3	222,087	4.02	13	Do.
18	.....do	17.4	183.7	182.6	R.	2,506	57,560	23.0	159.6	235,294	4.09	13	Do.
19	.....do	17.4	183.7	182.9	S.	2,510	60,416	24.1	158.8	248,725	4.12	15	Do.
25	.....do	15.9	182.1	181.0	F.	2,487	53,497	25.5	159.5	200,508	3.75	14	Do.
27	.....do	15.1	181.4	180.3	F.	2,486	52,480	21.1	159.2	194,092	3.70	12	Do.
Sept. 1	.....do	18.5	184.7	183.2	R.	2,517	61,876	24.6	158.6	252,079	4.07	15	Do.
4	.....do	20.3	186.6	185.3	F.	2,552	68,013	26.7	158.7	302,280	4.44	14	Do.
9	.....do	17.8	184.1	182.9	F.	2,506	60,746	24.2	158.7	236,986	3.90	14	Do.
11	.....do	17.3	183.6	182.5	R.	2,503	60,396	24.1	158.4	229,835	3.81	13	Do.
14	.....do	21.0	187.3	186.0	S.	2,569	72,432	28.2	157.8	309,202	4.27	14	Do.
15	.....do	20.9	187.2	185.9	S.	2,569	71,532	27.8	158.1	309,471	4.33	13	Do.
18	.....do	21.0	187.3	186.0	F.	2,565	69,739	26.9	159.1	307,127	4.45	15	Do.
Oct. 13	.....do	21.8	188.1	186.8	F.	2,575	73,470	28.5	158.3	316,967	4.31	10	Do.
14	.....do	21.5	187.8	186.5	F.	2,573	70,956	27.6	158.9	305,791	4.31	12	Do.
20	.....do	18.3	184.6	183.4	F.	2,519	64,069	25.4	158.0	236,831	3.70	12	Do.
26	.....do	16.3	182.6	181.5	F.	2,494	59,110	23.7	157.8	210,154	3.56	13	Do.
Nov. 2	.....do	15.2	181.4	180.5	F.	2,490	57,628	23.1	157.4	191,248	3.32	13	Do.
3	.....do	15.0	181.3	180.3	F.	2,489	55,684	22.4	157.9	189,900	3.41	13	Do.
9	.....do	15.2	181.4	180.6	F.	2,492	57,266	23.0	157.6	196,704	3.44	13	Do.
12	.....do	14.1	180.4	179.4	F.	2,487	55,778	22.4	157.0	178,471	3.20	13	Do.
20	.....do	10.3	176.6	175.7	F.	2,449	44,159	18.0	157.7	131,516	2.98	13	Do.
23	.....do	9.4	175.6	174.6	F.	2,443	41,111	16.8	157.8	117,316	2.85	13	Do.
28	.....do	6.9	173.2	172.4	F.	2,429	35,650	14.7	157.7	96,088	2.69	12	Do.
Dec. 4	.....do	5.1	171.3	170.6	F.	2,411	30,000	12.4	158.2	69,262	2.31	12	Do.

Dec. 23	.....do	2.3	168.6	167.9	R.	2,401	22,117	9.2	158.7	51,495	2.33	10	Do.
23	.....do	2.7	169.0	168.2	R.	2,401	22,631	9.4	158.8	54,940	2.43	12	Do.
1904.													
Mar. 9	.....do	10.0	176.3	175.6	R.	2,459	42,838	12.4	158.1	138,428	3.23	11	Do.
29	.....do	24.7	190.9	190.3	R.	2,663	81,115	30.5	159.9	397,672	4.90	11	Do.
31	.....do	25.2	191.4	190.5	S.	2,663	85,350	32.1	158.5	424,788	4.98	14	Do.
Apr. 2	.....do	24.5	190.8	189.9	F.	2,658	82,191	30.9	159.0	417,933	5.08	13	Do.
5	.....do	22.9	189.2	188.4	F.	2,603	77,255	29.6	158.7	352,262	4.56	14	Do.
12	.....do	23.6	189.8	188.9	S.	2,625	78,639	30.0	158.9	381,855	4.86	14	Do.
15	.....do	23.5	189.7	188.8	R.	2,626	78,972	30.1	158.7	390,489	4.95	13	Do.
29	Chester, Ill	33.6	199.8	157.5	R.	2,704	102,993	38.1	119.4	768,998	7.47	10	Do.
30[a]	.....do	33.5	199.8	157.7	R.	2,706	102,982	38.1	119.6	774,121	7.52	13	Do.
30[b]	.....do	33.4	199.7	157.7	S.	2,706	102,002	37.7	120.0	768,235	7.53	14	Do.
May 2[a]	.....do	32.9	199.1	157.5	F.	2,705	101,760	37.6	119.9	712,737	7.00	14	Do.
2[b]	.....do	32.7	199.0	157.4	F.	2,705	101,714	37.6	119.8	710,395	6.98	14	Do.
3[a]	.....do	32.3	198.6	157.1	F.	2,704	103,287	38.2	118.9	690,474	6.68	14	Do.
3[b]	.....do	32.2	198.5	157.0	F.	2,704	99,721	36.9	120.2	660,693	6.63	15	Do.
4	.....do	31.4	197.7	156.4	F.	2,703	100,161	37.1	119.4	658,876	6.58	15	Do.
5	.....do	30.2	196.5	155.6	F.	2,700	99,540	36.9	118.7	602,056	6.05	14	Do.
6	.....do	28.9	195.1	154.4	F.	2,697	93,590	34.7	119.7	547,126	5.85	20	Do.
7	.....do	27.6	193.8	153.1	F.	2,693	91,126	33.8	119.3	528,932	5.80	20	Do.
9	.....do	26.5	192.8	151.0	F.	2,686	84,196	31.3	119.7	457,771	5.44	14	Do.
16	Foot of Arsenal street, St. Louis, Mo	21.8	188.0	186.5	F.	2,573	68,856	26.8	159.8	330,355	4.80	10	Do.
18	.....do	21.5	187.8	186.3	R.	2,544	67,130	26.4	159.9	327,013	4.87	13	Do.
27	.....do	18.5	184.8	183.4	S.	2,540	60,218	23.7	159.7	265,023	4.40	14	Do.
June 1	.....do	23.7	190.0	188.4	R.	2,581	71,423	27.7	160.7	377,129	5.28	13	Do.
14	.....do	24.5	190.7	189.1	S.	2,603	74,330	28.6	160.6	385,371	5.18	13	Do.
21	.....do	25.1	191.4	189.7	R.	2,625	75,631	28.8	160.9	389,844	5.15	14	Do.
23	.....do	25.0	191.3	189.7	F.	2,626	75,761	28.9	160.8	386,471	5.10	14	Do.
29	.....do	22.7	188.9	187.5	R.	2,578	72,024	27.9	159.8	348,263	4.84	14	Do.

[a] a. m. [b] p. m.

Zero, Engineer Department gauge, foot of Arsenal street, is 165.91 feet, St. Louis datum.
Zero, Chester, Ill., gauge, is 127.29 feet, St. Louis datum.

ORGANIZATION.

During the year death has made serious inroads upon the working force of this district, depriving it of the services of two of its principal employees.

On September 20, 1903, Mr. William C. Stevens, who had been connected with the Engineer Department, in various districts, since 1880, as clerk and chief clerk, and whose conscientious services were of great value to the officer in charge, died at St. Louis, Mo., after some months' illness.

On June 28, 1904, Mr. D. M. Currie, who had been connected with the Mobile, Ala., district from 1871–72, and with the St. Louis district since 1873 as assistant engineer and principal assistant engineer, died suddenly at St. Louis, Mo. The loss of this faithful, genial, and efficient assistant is deeply felt by all who were associated with him, and his long experience in the work of the district rendered his services especially valuable to the Government.

Mr. S. G. Clark was promoted to be chief clerk on October 12, 1903, and Mr. William S. Mitchell to be principal assistant engineer on June 29, 1904.

On October 1, 1904, Junior Engineers W. M. Penniman and F. Y. Parker were promoted to be assistant engineers.

ESTIMATES.

The original estimate of the cost of the improvement of the Mississippi River between the mouths of the Ohio and Missouri rivers, as revised in 1883, is $16,397,500.

The total appropriations to date amount to $11,754,999.98. Of this amount $180,000 was alloted by acts and projects for improvement between the Illinois and Missouri rivers, including Alton Harbor, leaving a balance of $11,574,999.98 to be applied to the project for the general improvement between the mouths of the Ohio and Missouri rivers. The balance of the estimate for the original project for the general improvement between the Ohio and Missouri rivers not appropriated June 30, 1904, is therefore $4,822,500.02.

The amount that has been expended upon the project to this date is $10,629,390.66.

The balance available June 30, 1904, of the amount appropriated is $945,609.32, to which must be added $3,704.61 received from miscellaneous receipts, a total of $949,313.93, exclusive of outstanding liabilities.

The amount expended during the fiscal year was $591,432.89, of which $590,632.89 was by voucher and $800 was reserved for the Board of Engineers on Rivers and Harbors.

The river and harbor act approved June 30, 1896, provides:

> That any balance of former appropriations now available, and the money hereby appropriated and authorized to be expended for the said section of the river between the mouth of the Missouri River and the mouth of the Ohio River, or so much thereof as may be necessary, shall be expended in the construction of suitable dredge boats, portable jetties, and other suitable appliances, and in the maintenance and operation of the same, with the view to ultimately obtaining and maintaining a navigable channel from St. Louis to Cairo not less than two hundred and fifty feet in width and nine feet in depth at all periods of the year, except when navigation of the river is closed by ice.

In the $10,629,390.66 above mentioned is included all amounts expended for dredge plants, portable jetties, and appliances for temporary improvement of the channel and for operating the same, altogether $630,836.34. Of this, $906.30 was expended during the fiscal year for dredging. The approximate value of this plant at the beginning of the fiscal year was $194,677.10. Its present approximate value is $181,136.33.

The available balance includes the unexpended balance from special allotment made by Congress, as follows:

For protection of bank on Missouri side and to deepen and straighten channel at Wittenberg, Mo., act of March 3, 1899	$10,000

Money statement.

July 1, 1903, balance unexpended		$889,526.11
Amount appropriated by sundry civil act approved April 28, 1904		650,000.00
July 1, 1904, miscellaneous receipts		1,220.71
		1,540,746.82
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$399,740.43	
For maintenance of improvement	191,692.46	
		591,432.89
July 1, 1904, balance unexpended		949,313.93
July 1, 1904, outstanding liabilities		33,721.26
July 1, 1904, balance available		[a]915,592.67
July 1, 1904, amount covered by uncompleted contracts		50,699.46
Amount (estimated) required for completion of existing project		4,822,500.02
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$850,000.00	
For maintenance of improvement	150,000.00	
		1,000,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

LIST OF APPROPRIATIONS.

By act of—		By act of—	
June 10, 1872	$100,000.00	August 18, 1894	$758,333.33
March 3, 1873	200,000.00	March 2, 1895	758,333.33
June 23, 1874	200,000.00	June 3, 1896	275,000.00
March 3, 1875	200,000.00	June 4, 1897	673,333.33
August 14, 1876	200,000.00	July 19, 1897	325,000.00
June 18, 1878	240,000.00	July 1, 1898	673,333.33
March 3, 1879	200,000.00	March 3, 1899	673,333.33
June 14, 1880	250,000.00	June 6, 1900	100,000.00
March 3, 1881	600,000.00	June 13, 1902	650,000.00
August 2, 1882	600,000.00	March 3, 1903	650,000.00
July 5, 1884	520,000.00	April 28, 1904	650,000.00
August 5, 1886	375,000.00	Other receipts	3,704.61
August 11, 1888	300,000.00		
September 19, 1890	400,000.00		
July 13, 1892	525,000.00	Total	11,758,704.59
March 3, 1893	658,333.33		

[a] Distributed under subheadings as follows:

For from mouth of Ohio River to mouth of Missouri River (acts of March 3, 1903, and April 28, 1904)	$884,845.35
For protection of bank on Missouri side and to deepen and straighten channel at Wittenberg, Mo. (act of March 3, 1899)	10,000.00
For allotment for Sawyers Bend (act of June 13, 1902)	20,747.32
Total	915,592.67

LIST OF CONTRACTS IN FORCE JUNE 30, 1904.

Name.	Article.	Rate.	Date of contract (1904).	Date of beginning (1904).	Date of expiration (1904).
Robt. N. Davis, Fredericktown, Mo.	2,000 second-class piles	4¾–5¾ cents per linear foot.	Mar. 15	Mar. 30	Dec. 31.
M. E. Leming, Cape Girardeau, Mo.	2,000,000 feet mattress lumber.	$14.35 per M	Mar. 16	Mar. 31	Do.
Albert Bussen, Quarantine, Mo.	3,500 cubic yards stone	60 cents per cubic yard	...do	...do	Do.
C.C. Huthmacher, Grand Tower, Ill.	12,500 cubic yards stone. 5,000 cubic yards spalls.	.....do 50 cents per cubic yard	Mar. 17	Apr. 1	Do.
Herman W. Bussen, Oakville, Mo.	4,000 cubic yards stone	60 cents per cubic yard	Mar. 18	Apr. 2	Do.
Charley D. Davis, Carrsville, Ky.	....do 1,000 cubic yards spalls.	59 cents per cubic yard 50 cents per cubic yard	..do	...do	Do.
John Cleary, Chester, Ill.	500 first-class piles 1,000 second-class piles	11 cents per linear foot 6½–9 cents per linear foot.	Mar. 28	Apr. 12	Do.

COMMERCIAL STATISTICS.

Receipts and shipments at St. Louis, Mo., during the year 1903.

	Tons.
Receipts:	
Barbed wire, ores, and metals (pig and manufactured)	2,185
Coal and coke	......
Cotton and cotton products	862
Groceries and dairy products	2,868
Hay, seed, grain, flour, meal, etc	20,553
Live stock and products	27,039
Lumber	5,900
Merchandise and sundries	266,199
Vegetables and fruits	7,420
White lead, oils, etc	36
Wines and liquors	7,190
Wool	158
Total	340,410
Shipments:	
Barbed wire, ores, and metals (pig and manufactured)	1,900
Coal and coke	108
Cotton and cotton products	718
Groceries and dairy products	4,737
Hay, seed, grain, flour, meal, etc	101,959
Live stock and products	5,078
Lumber	2,754
Merchandise and sundries	90,568
Vegetables and fruits	2,625
White lead, oils, etc	1,273
Wines and liquors	486
Wool	1
Total	212,207

Transferred by ferries across the river at St. Louis.

	Tons.
1900	5,218,967
1901	5,860,592
1902	5,731,635
1903	6,328,154

Shipments of grain, including flour, meal, etc., and coal down the river from landings between St. Louis and Cairo during the year 1903 amounted to 43,867 tons.

List of steam-power boats that arrived at St. Louis during the year 1903.

Size of boats.	Draft.	Number.	Times arrived.
	Feet.		
Under 500 gross tons	2.5–6.0	90	1,192
Between 500 and 1,000 gross tons	4.0–7.6	9	412
Over 1,000 gross tons		1	1
Total		100	1,605

List of barges and scows that arrived at St. Louis during the year 1903.

Size of boats.	Draft.	Number.	Times arrived.
	Feet.		
Under 500 gross tons	2.5–7.5	317	494
Between 500 and 1,000 gross tons	5.2–8.0	11	29
Total		328	523

Number of vessels, and their tonnage, permanently and temporarily enrolled and licensed at the port of St. Louis, Mo., December 31, 1903.

	Number of vessels.	Gross tonnage.	Net tonnage.
Permanent enrolled steamers:			
Wood	75	23,017	21,142
Iron and steel	8	2,999	2,325
Permanent enrolled barges:			
Wood	39	34,594	34,525
Steel	1	1,162	1,162
Permanent enrolled steam yachts:			
Wood	3	271	173
Steel	2	177	123
Permanent enrolled sailing yachts:			
Wood	1	30	26
Steel	1	62	62
Temporary enrolled steamers, steel	1	30	19
Licensed steamers:			
Wood	13	145	108
Steel	2	56	29
Licensed barges	1	16	16
Licensed sailing yachts, wood	1	9	8
Licensed steam yachts, wood	2	24	20
Total	150	62,592	59,738

Total cost and work done to June 30, 1904.

	Linear feet.		Square feet (new).	Cost.	Total.
	New.	Repairs.			
Dikes and dams:					
Prior to July 1, 1903	39,367			$814,358.33	
During fiscal year 1904					$814,358.33
Hurdles:					
Prior to July 1, 1903	352,705	82,055		5,731,821.98	
During fiscal year 1904	5,020	5,110		291,237.49	6,023,059.47
Bank protection:					
Prior to July 1, 1903	252,507	14,502	34,988,791	2,257,581.76	
During fiscal year 1904	17,964	13,575	3,586,750	286,702.22	2,544,283.98
Total construction	667,563	115,242	38,575,541		9,381,701.78
Jetties:					
Prior to July 1, 1903				114,603.53	
During fiscal year 1904					114,603.53

Total cost and work done to June 30, 1904—Continued.

	Linear foot.		Square feet (new).	Cost.	Total.
	New.	Repairs.			
Dredging:					
Prior to July 1, 1903				$294,518.89	
During fiscal year 1904				906.30	
					$295,425.19
Surveys and gauges:					
Prior to July 1, 1903				214,323.80	
During fiscal year 1904				17,972.22	
					232,296.02
Examinations:					
Prior to July 1, 1903				12,391.96	
During fiscal year 1904					
					12,391.96
Total					10,036,418.48

RECAPITULATION.

Dikes and dams	$814,358.33	
Hurdles	6,023,059.47	
Bank protection	2,544,283.98	
		$9,381,701.78
Jetties	114,603.53	
Dredging	295,425.19	
		410,028.72
Surveys and gauges	232,296.02	
Examinations; etc	12,391.96	
		244,687.98
Total		10,036,418.48

Property account.

Class.	Value July 1, 1903.	Debits.	Credits.	Value June 30, 1904.
Steamer Gen. T. L. Casey	$12,885.78	$13,425.71	$15,286.09	$11,025.40
Steamer Gen. H. L. Abbot	20,559.82	16,695.29	19,248.75	18,006.36
Steamer Wm. R. King	58,216.20	29,394.01	32,834.59	54,775.62
Dredge No. 1	7,436.48	158.43	1,243.06	6,351.85
Dredge No. 2	9,915.30	768.23	2,199.75	8,483.78
Dredge No. 3	86,390.03	1,033.10	6,138.85	81,284.28
Dredge No. 4	84,490.34	1,158.49	6,151.87	79,496.96
Steam tenders, wood	7,968.92	14,614.96	7,592.51	14,991.37
Steam tenders, steel	47,043.61	2,297.99	5,078.26	44,263.34
Barges, model	113,291.91	38,141.15	24,575.09	126,857.97
Store boat	2,178.27	402.84	717.33	1,863.78
Quarter boats	20,913.20	6,552.54	9,571.12	17,894.62
Office and survey boats	8,109.06	2,623.87	1,524.34	9,208.59
Pile drivers	45,603.29	15,027.53	12,930.65	47,700.17
Derrick boats	2,230.94	1,807.88	700.03	3,338.79
Derricks	2,478.83		357.88	2,120.95
Machine shops	1,239.41	1,881.69	3,121.10	
Small boats	23,709.49	5,255.98	8,307.56	20,657.91
Steel flats	10,233.90	4,084.61	1,209.32	13,109.19
Portable quarters	1,631.37	41.96	277.49	1,395.84
Jetty gates	6,444.95	292.24	1,217.73	5,519.46
Ways (engineer depot)	3,276.27	861.92	4,138.19	
Engineer depot	3,470.36	15,879.72	2,796.04	16,664.04
Tools and appliances	15,545.35	10,365.52	8,709.97	17,200.90
Boarding outfit	16,149.35	2,459.34	4,010.56	14,598.13
Office furniture	591.32	25.00	113.70	502.62
Survey instruments	1,336.48	121.45	258.91	1,199.02
Models (Louisiana Purchase Exposition)	414.00	108.12		522.12
Total	613,754.23	185,479.57	180,310.74	618,923.06

Material account.

Class.	Value July 1, 1903.	Debits.	Credits.	Value June 30, 1904.
Subsistence	$3,183.00	$57,323.51	$59,056.44	$1,450.07
Piles	3,363.69	34,769.67	34,588.76	3,544.60
Stone	2,545.78	146,198.38	148,371.11	373.05
Rope	24,885.96	8,259.45	2,305.81	30,839.60
Wire	1,795.06	6,962.86	7,674.01	1,083.91
Iron	3,038.53	2,322.04	2,142.45	3,218.12
Nails	879.45	2,281.15	1,933.83	1,226.77
Spikes	1,270.18	952.06	935.31	1,286.93
Lumber, miscellaneous	14,670.86	17,953.85	22,633.38	9,991.33
Lumber, mattress		79,549.49	79,511.47	38.02
Oakum	381.24	1,304.00	1,033.20	652.04
Coal	1,700.84	43,809.50	42,680.07	2,830.27
Ice		3,715.07	3,715.07	
Material, miscellaneous	18,089.34	21,766.64	25,085.42	14,770.56
Total	75,803.93	427,167.67	431,666.33	71,305.27

Engineer office, United States Army, in account with United States from 1870 to June 30, 1904.

	To allotments, appropriations, etc., prior to July 1, 1903:		
1872–1880.	Allotments for surveys	$51,208.77	
1876–1897.	Special appropriations	401,600.00	
1879–1903.	Miscellaneous receipts	4,639.73	
1872–1903.	Appropriations, general improvement	11,129,999.98	
			$11,587,448.48
Apr. 28, 1903.	Appropriation, Mississippi River between Ohio and Missouri rivers		650,000.00
	To miscellaneous receipts deposited:		
July 20, 1903.	Sale of condemned property	$659.75	
	Overpayment, voucher 84, October, 1902	.87	
	Overpayment, voucher 104, November, 1902	1.50	
Nov. 18, 1903.	Major Chittenden, snag boat *C. R. Suter*	424.72	
Dec. 22, 1903.	Unclaimed wages due	25.75	
Jan. 30, 1904.	Ordnance Department, gun exhibit, Louisiana Purchase Exposition, 1904	108.12	
			1,220.71
	To nonpayments:		
June 30, 1904.	Unpaid percentage on annulled contracts	900.17	
	Unpaid percentage on contracts in force	641.40	
	Unpaid labor	29,286.37	
	Unpaid miscellaneous	15,289.65	
			46,117.59
	Total		12,284,786.78
June 30, 1904.	By construction between Illinois and Missouri rivers:		
	Piasa Island dam	$37,910.41	
	Piasa Island dam, cutting channel	3,116.86	
	Alton dam	33,740.05	
	Alton dike	126,652.74	
			201,420.06
	By construction between Ohio and Missouri rivers		9,381,701.78
	By jetties		114,603.53
	By dredging		295,425.19
	By surveys and gauges		244,687.98
	By withdrawn for Office of Chief of Engineers		2,220.50
	By withdrawn for Board of Engineers for Rivers and Harbors		800.00
	By loss account		404,385.48
	By property on hand		618,923.06
	By material on hand		71,305.27
	By appropriations unexpended, Mississippi River, Ohio to Missouri		949,313.93
	Total		12,284,786.78

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS RELATIVE TO ESTABLISHING AND MAINTAINING IN THE MISSISSIPPI RIVER BETWEEN THE MOUTHS OF THE MISSOURI AND OHIO RIVERS A SUITABLE CHANNEL AT LESS EXPENSE THAN THAT UNDER THE EXISTING PROJECT.

[Printed in House Doc. No. 168, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
United States Army,
Washington, December 3, 1903.

Sir: I have the honor to submit herewith a report, dated November 12, 1903, by the Board of Engineers for Rivers and Harbors, constituted under the provision of section 3 of the act approved June 13, 1902, relative to the improvement of the Mississippi River between the mouth of the Missouri River and the mouth of the Ohio River, with a view to ascertaining whether, by dredging or otherwise, a suitable channel can not be established and maintained at less expense than in accordance with the existing project. This report is made in pursuance of a resolution of the Committee on Rivers and Harbors of the House of Representatives, transmitted to this office by Hon. T. E. Burton, with letter dated April 25, 1903, an extract from which is quoted in the accompanying report.

The object to be attained under the present project is stated in full in the Board's report. For reasons given in its report, the Board states that its estimate of the cost of completing the improvement by the methods of the present project must be regarded as merely tentative. It considers that a suitable channel between St. Louis and Cairo is one 8 feet deep and 200 feet wide where alignment is favorable, and of suitably greater width in the bends and where alignment is unfavorable, and 6 feet deep from St. Louis to the mouth of the Missouri at low stages. The Board considers it practicable to secure this result by contraction works and shore protection, the tentative estimated cost being $20,000,000 in addition to expenditures already made, with annual expenditures thereafter for maintenance amounting to $400,000. The Board considers also that there is reasonable prospect that this cost can be materially reduced by more extensive dredging than at present, the estimated cost of adequate additional plant being $450,000, with $250,000 annually for operation, maintenance, and renewal.

In the opinion of the Board, $1,200,000 should be appropriated in one sum for the dredging plant to insure its completion and operation for a term of three years; and until the results of the dredging be known there should be expended annually for permanent work and temporary expedients (except dredging) the sum of $300,000.

I recommend that this letter and the accompanying paper be transmitted to the Speaker of the House of Representatives for the information of Congress, in response to request in the above-mentioned resolution.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., November 12, 1903.

GENERAL: By first indorsement, office Chief of Engineers, United States Army, May 1, 1903, there was referred to the Board of Engineers for Rivers and Harbors a resolution adopted by the Committee on Rivers and Harbors of the House of Representatives, of which the following are extracts:

> *Resolved by the Committee on Rivers and Harbors,* That the Board of five engineer officers established by section three of the river and harbor act of June thirteenth, nineteen hundred and two, be requested to make reports to Congress not later than the first Monday in December, nineteen hundred and three, upon the following projects, with a view to making recommendations upon the desirability of continuing the same, or any modification thereof, or to report as specifically stated, with the designation of the respective projects:
>
> * * * * * * *
>
> The Mississippi River between the mouth of the Missouri River and the mouth of the Ohio River, with a view to ascertaining whether, by dredging or otherwise, a suitable channel can not be established and maintained at less expense than in accordance with the existing project.
>
> * * * * * * *

In its study of this question the Board has had the benefit of the written opinions and arguments of the district officers now and formerly in charge of the improvement of this section of river. A committee of the Board has inspected the river between the mouth of the Missouri and the mouth of the Ohio, and has studied on the ground the dredging operations and plant employed between Cairo and Memphis. Estimates and other data have been secured from the engineer office at St. Louis and from the office of the Mississippi River Commission. Assistant engineers in local charge of the work of regularization between St. Louis and Cairo and of dredging operations below Cairo have been freely consulted. Finally the Board availed itself of the services of Dr. John Franklin Crowell, internal-commerce expert of the Bureau of Statistics, in its study of the question of most suitable channel dimensions as related to the commercial needs of the territory affected by the existence of this waterway.

The report[a] submitted by Doctor Crowell confirms the Board in its opinion that a barge channel from St. Louis to Cairo, 8 feet deep at the lowest stages, would, as an actual and potential freight route, confer benefits upon a wide section of country far beyond its cost. Great engineering difficulties stand in the way of a deeper channel. From the mouth of the Missouri to St. Louis a steamboat channel 6 feet deep at low water will be ample. The Board therefore adopts these depths for the "suitable" channel referred to in the resolution of the committee of Congress.

Regularization assisted by dredging is the method contemplated by the present project for the improvement of this stretch of river. This project is thus described in the Annual Report of the Chief of Engineers for 1903:

> The present project is a continuation of the plan adopted in 1881.
>
> It contemplates confining the flow of the river to a single channel having an approximate width below St. Louis of 2,500 feet at bank-full stage, the natural width in many

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[a] Not printed.

places being a mile or more at mean high water. This result is to be attempted by closing sloughs and secondary channels and by building out new banks where the natural width is excessive, using for this purpose permeable dikes or hurdles of piling that collect and hold the solid matter that is carried in suspension or rolled on the bottom by the river. The banks, both old and new, are to be revetted or otherwise protected where necessary to secure permanency. Pending the completion of the permanent improvement the low-water channel is to be improved each season by the use of dredges and other temporary expedients.

The object of the improvement is to obtain eventually a minimum depth at standard low water of 6 feet from the mouth of the Missouri to St. Louis, and of 8 feet from St. Louis to the mouth of the Ohio.

The original estimate of the cost of the improvement, as revised in 1883, is $16,397,500.

The total amount expended to June 30, 1903, was $10,037,957.77. * * *

The effect of the work done is thus stated in the same report:

The result of the expenditure of this amount has been the partial improvement of the entire reach of the river from St. Louis to Cairo. During the past year there was at all times during open navigation a channel depth of 6 feet or more throughout this reach. The river attained a low-water stage of 3.5 feet above standard low water.

With the present appliances and such others as may be developed for the temporary improvement of low-water channels, it is expected that a navigable depth of at least 6 feet will be maintained between St. Louis and Cairo during all stages, while the river is open to navigation, until the projected depth can be obtained throughout by the extension and completion of the permanent works.

It is impossible to estimate the cost of the work remaining to be done in the manner common to most engineering works. If a river is to be improved by means of locks and dams, it is practicable to determine in advance the number of structures required and the best type and approximate cost of each. Reasonably close estimates of cost may be made in the case of harbor improvements. In the case of river regularization, however, the required structures and their definite locations can be determined upon only from time to time as groups of structures are about to be begun. The channel before improvement is continually changing and local conditions in any reach of river can not be known years in advance of its proposed improvement. For this reason the Board's estimate of cost of completing the improvement by the methods of the present project must be regarded as merely tentative. This estimate will be found hereinafter stated.

With regard to dredging, it is well known that improvements in plant in the last few years have modified many engineering projects. As to dredging in large alluvial rivers, much experience has been recently gained, especially upon Russian rivers and upon the lower Mississippi. It is believed that favorable results have been secured abroad, especially upon the Volga. As to experience upon the lower Mississippi, attention is invited to the following extracts from the report of the Mississippi River Commission for 1903:

The system of hydraulic dredging was therefore adopted in 1896, and under the requirements of recent acts of Congress there is now maintained by this means a channel 9 feet in depth and 250 feet in width at all stages of the river from Cairo southward.

* * * * * * *

The dredging operations covered the low-water intervals during the period from the latter part of August to the latter part of November. The season was unusually favorable as far as the stage of the river was concerned, and as a consequence but little time was actually employed in dredging.

* * * * * * *

Dredging during the season was confined to the river between Darnells bar (80) and Ashley Point (271). In this reach channels were opened through 11 different bars, and some dredging was done to remove the bar in front of Memphis wharf. A depth of 9 feet or more was maintained throughout the entire season on all crossings from Cairo to the lower limits covered by the dredging operations.

The maintenance of a navigable channel, ample in width and depth throughout several successive low-water seasons, emphasizes the conclusions announced in previous reports—that it is entirely practicable to maintain at all stages, by means of suitable equipment of dredges, a navigable channel at least 9 feet in depth and 250 feet in width, as required by act of Congress.

Two large modern dredges are already available for work between St. Louis and Cairo, having been built in accordance with the will of Congress as expressed in section 1 of the river and harbor act approved May 11, 1896. In the light of recent experience, which requires that dredging operations should begin while there is still a considerable depth upon the bars, it is certain that the efficiency of these dredges will be promoted if their suction pipes be lengthened. The alteration of these dredges and the procurement of two self-propelling dredges of the type of the *Kappa*, recently constructed for work below Cairo, would equip the St. Louis-Cairo section with the minimum plant which might reasonably be expected to maintain a suitable channel. The alterations, the new dredges, and incidental plant would cost $450,000, while the annual charge for operation, maintenance, and renewal of plant may be estimated at $250,000. These estimates are made upon the assumption that the dredging plant would be supplemented by tenders, etc., drawn from the plant now engaged in the improvement of the river.

The Board invites especial attention to the fact that a channel, to be most efficient commercially, must be maintained of suitable dimensions throughout the season of navigation for a considerable period of years. Otherwise the capital will not be found for the freight carriers. If there be a greater resort to dredging, there should be an increased certainty of appropriation.

In recommending hereinafter a policy to be pursued in the improvement of the Mississippi River between the mouth of the Missouri and the mouth of the Ohio, and a project for work in the immediate future, the Board is convinced that such policy and project, if adopted, will provide the desired results at a minimum of expenditure, and, furthermore, in the shortest practicable time.

The Board has the honor to submit the following statement of its recommendations and conclusions:

(*a*) A suitable channel in the Mississippi River between St. Louis and Cairo is one 8 feet deep, 200 feet wide where alignment is favorable, and of suitably greater width where alignment is unfavorable, adapted to a barge navigation throughout all seasons of the year, except when the river is closed by ice. A suitable channel from the mouth of the Missouri to St. Louis is a steamboat channel 6 feet deep at low stages.

(*b*) To secure this result by contraction work and shore protection is practicable.

(*c*) The cost of securing the desired result in the manner last mentioned would be at least $20,000,000 in addition to expenditures already made, with annual expenditures thereafter for maintenance amounting to $400,000.

(*d*) There is a reasonable prospect that this cost can be materially reduced by a use of dredging more extensive than is made at the present time. A dredging plant adequate for a trial would cost $450,000 for alterations and additions to existing plant, with annual expenditures for operation, maintenance, and renewal of plant amounting to $250,000.

(*e*) One million two hundred thousand dollars should be appropriated in one sum for the dredging plant to insure its completion and operation for a term of three years.

(*f*) Until the results of the dredging be known, there should be expended annually for permanent work and temporary expedients (except dredging) the sum of $300,000.

(*g*) After a trial of the more extended dredging, the project for establishing the channel should be revised in the light of the experience thus gained.

Respectfully submitted.

Chas. J. Allen,
Lieut. Col., Corps of Engineers.
H. F. Hodges,
Major, Corps of Engineers.
C. H. McKinstry,
Captain, Corps of Engineers.
W. V. Judson,
Captain, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.

MINORITY REPORT OF THE BOARD.

I can not concur in full with the recommendations made in its report by the majority of the Board of Engineers for Rivers and Harbors.

The improvements made in recent years in the construction of hydraulic dredges and the better results obtained by the operation of such dredges in alluvial streams, as experience is gained in such work from year to year, are all fully appreciated, as is also the probability that such operations have as yet by no means reached their maximum efficiency. The value of these machines, aided by other expedients, in temporarily improving the conditions of low-water navigation in the Mississippi River between St. Louis and the mouth of the Ohio River is by no means overlooked. Indeed, it is my opinion that such operations should be extended in scope to the extent necessary to produce temporarily the best channel practicable, and I therefore concur in the recommendations of the Board in regard to dredges and dredging, but only as a temporary expedient.

My experience in charge of this improvement during the low-water seasons of 1899, 1900, and 1901 leads me to believe that the permanent improvement of this river is feasible from a technical standpoint, and that such an improvement will produce a low-water barge channel so superior in location, width, permanence, and certainty to any temporary dredged channel, that it is much to be preferred to the latter even at a conceded greater cost.

The commerce of the Mississippi in the past has been large and important, notwithstanding the obstructions to a free and economical navigation. Of recent years its importance has declined, and for the reason that the delays and expense of an uncertain navigation have made water transportation via this route unable to compete with the economies achieved in modern railroad transportation. The value of the Mississippi River as a transportation route is not disputed, and should increase in the future rather than decline; but this value can be fully realized only by providing a low-water channel that will permit of barge transportation with safety, certainty, and the least practicable delay en route. Such a channel appears to have been produced and maintained below the mouth of the Ohio by the dredging operations carried on under the direction of the Mississippi River Commission.

The full value of the Commission's low-water dredged channel can, however, be realized only by the permanent and certain maintenance of a corresponding channel from St. Louis to the Ohio. The Ohio does not now, and can not for many years to come, contribute any low-water traffic to the lower Mississippi. That traffic must come from the middle Mississippi and mainly from St. Louis, where trade and crop conditions are such that transportation to the seaboard is most active during the low-water season of the summer and fall. The maintenance with certainty of a thoroughly satisfactory low-water barge channel in the middle Mississippi is therefore not only a prerequisite to the reestablishment of the former large commerce of that section of the river, but is also the only means of supplying to the improved dredged channels of the lower river a low-water commerce of any magnitude. I differ from the majority of the Board only as to the means and methods to be employed to secure such a channel with that certainty as to satisfactory maintenance which is necessary to attract the large amount of capital required for the reestablishment of barge transportation from St. Louis to New Orleans after the discouraging results of recent years.

The hydraulic conditions below the Ohio are materially different from those that exist between the mouths of the Ohio and the Missouri. Indeed, the very factors—greater discharge and relatively smaller amounts of alluvial material in motion—that rendered financially and otherwise impracticable the permanent improvement of the lower river have made it more susceptible of satisfactory improvement by dredging. The contrary conditions above the Ohio favor the success of a permanent improvement, but very materially increase the difficulties of maintaining a dredged channel satisfactory as to depth, and, of greater importance and difficulty, suitably located and certainly maintained.

With the smaller flow of the middle river the difficulty of maintaining the desired channel, 8 feet in depth, will be relatively much greater than for the 9-foot channel of the lower river. My experience upon this improvement firmly convinces me that a suitable barge channel can not be maintained at all points by dredging alone. Its maintenance by dredging, aided by a liberal use of temporary and semipermanent expedients, designed to more or less fully serve the same purposes as the works for permanent improvement, is probably, but not certainly, feasible. Under that system great dependence must be placed upon these expedients for the maintenance of the channel in some localities, and this dependence must necessarily increase with the undoubted deterioration of the existing, partially completed works of permanent improvement, whose maintenance, together with the construction of temporary expedients in aid of dredging, can not be secured from the sum recommended for that combined purpose.

It is therefore my opinion that the permanent improvement of this section of the Mississippi should be continued under the existing project, with such reasonable modifications as are ordinarily left to the judgment of the constructing engineer, and with appropriations sufficient in amount to push it to completion within a reasonable time. Pending this completion the temporary improvement of the low-water channel by dredging, aided by other expedients, should be carried on more extensively than in the past in order to provide the best channel practicable with the use of such means. Such temporary or semipermanent expedients as are employed to assist in maintaining dredged channels should, if properly applied, lead to an appreciable reduction in the total cost of the permanent improvement.

Under existing circumstances it is impracticable for me to submit an estimate of the cost of completing the existing project, but the district officer's estimate should, in my opinion, be ample for that purpose, if appropriations were made in amounts commensurate with the magnitude of the work. Under other circumstances it is impracticable to submit any estimate as to its final cost.

Respectfully submitted.

EDW. BURR,
Major, Corps of Engineers.

X 3.

PRELIMINARY EXAMINATION OF MISSOURI CHUTE, MISSISSIPPI RIVER, MISSOURI.

[Printed in House Doc. No. 76, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 1, 1903.

SIR: I have the honor to submit herewith a report, dated September 11, 1902, by Maj. Thomas L. Casey, Corps of Engineers, on preliminary examination of Missouri Chute, Missouri, with a view to ascertaining whether the closing of the same is required in the interests of navigation. Missouri Chute is understood to be an old channel of the Mississippi River, lying between Puckett Island and the Missouri shore, and the project for the general improvement of the river contemplates the complete closure of this channel.

This examination has been made in compliance with a requirement in the river and harbor act of June 13, 1902, and in the opinion of Major Casey, concurred in by the division engineer, Col. Amos Stickney, Corps of Engineers, and by the Board of Engineers for Rivers and Harbors, which has reviewed this report under the provisions of sections 3 and 14 of the above-mentioned act, the closure of Missouri Chute is not urgent. The Board states, in its report of January 8, 1903, that it is not advisable to hamper in any degree the general improvement of the river in order to take up this work in advance of its proper turn.

I concur in the views of the Board.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF MAJ. THOS. L. CASEY, CORPS OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,
St. Louis, Mo., September 11, 1902.

GENERAL: In reply to Department letter of August 30, 1902, requesting me to make a preliminary examination of "Missouri Chute, with a view to ascertaining whether the closing of the same is required in the interest of navigation," and directing me to render a report thereon, I have the honor to state that under date of June 28, 1902, I transmitted the following letter to the Department:

JUNE 28, 1902.

GENERAL: I have the honor to acknowledge receipt of Department letter of June 23, 1902, directing me to make a preliminary examination of "Missouri Chute, with a view to ascertaining whether the closing of the same is required in the interest of navigation," and to make a report thereon.

In compliance with these instructions I have to respectfully report that a careful examination of the available maps of the Mississippi and Missouri rivers (within the State of Missouri) fails to reveal the location of Missouri Chute. No one connected with this office knows of any such locality, nor is it known to the officials of the Pilots' Society in this city. Inquiry of the Mississippi and Missouri River Commission officers is equally without satisfactory result.

I would respectfully request that some more definite information as to the locality be furnished me.

Very respectfully, your obedient servant,

THOS. L. CASEY,
Major, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

The indorsements upon this letter were the following:

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
July 3, 1902.

Respectfully returned to Major Casey.

It is understood that the "Missouri Chute" contemplated by the act is at or near the north end of Crains Island.

Such appears to be the understanding of the chairman of the River and Harbor Committee.

To be returned.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Second indorsement.]

ENGINEER OFFICE, U. S. ARMY,
St. Louis, Mo., July 5, 1902.

Respectfully returned to the Chief of Engineers, United States Army.

If the "Missouri Chute" referred to is that between Crains Island and the Missouri shore, it is now closed at both ends at low water. The present approved project for improving the Mississippi River in that locality contemplates closing it also at high stages.

No survey is considered necessary.

If further report on this subject is desired by the Department, instructions are respectfully requested.

THOS. L. CASEY,
Major, Corps of Engineers.

[Third indorsement.]

Office Chief of Engineers, U. S. Army,
July 12, 1902.

Respectfully returned to Major Casey.

No further examination is considered necessary in this case, and the facts contained in second indorsement will constitute sufficient report.

It is suggested that such facts be put in the form of a report on preliminary examination and submitted through the division engineer.

To be returned.

A. Mackenzie,
Acting Chief of Engineers.

[Fourth indorsement.]

Engineer Office, U. S. Army,
St. Louis, Mo., July 16, 1902.

Respectfully returned to the Chief of Engineers, United States Army.

The instructions contained in preceding indorsement will be complied with.

Thos. L. Casey,
Major, Corps of Engineers.

In compliance with the third indorsement, I would respectfully state that available information seems to indicate the chute between Puckett Island and the Missouri shore—an old main river channel—as being the "Missouri Chute" mentioned in the act of June 13, 1902. Puckett Island is separated from Crains Island by a very narrow bayou, never containing much water except at high stages, so that the two together are generally spoken of as Crains Island.

The "Missouri Chute" mentioned in the act is at present closed at both ends at low stages, and the general scheme of improvement of the Mississippi River has in view its complete closure when funds become available for that purpose, but at the present time there is no tendency in the river to resume its old channel through the chute, and the matter is therefore of no pressing moment.

Very respectfully, your obedient servant,

Thos. L. Casey,
Major, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Western Division, Office of Division Engineer,
St. Louis, Mo., September 12, 1902.

Respectfully forwarded to the Chief of Engineers, United States Army.

A recent inspection of the locality shows that the chute is nearly closed, and that the works in the vicinity are designed with reference to a channel on the other side of the river.

The views of the district officer are concurred in.

Amos Stickney,
Colonel of Engineers,
Division Engineer, Western Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 18, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 8, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Major Casey on the preliminary examination of Missouri Chute, Missouri, and the indorsement of the division engineer.

Missouri Chute is now closed at low water, and the general scheme of improvement of the Mississippi River contemplates closing it at high water.

The Board is of the opinion that the closure of Missouri Chute is not urgent, and that it is not advisable to hamper in any degree the general improvement of the river in order to take up this work in advance of its proper turn.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

APPENDIX Y.

OPERATING SNAG BOATS AND DREDGE BOATS ON UPPER MISSISSIPPI RIVER; IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN MOUTH OF MISSOURI RIVER AND ST. PAUL, MINNESOTA, AND OF LA CROSSE HARBOR, WISCONSIN; OPERATING AND CARE OF GALENA RIVER IMPROVEMENT, ILLINOIS, AND OF ILLINOIS AND MISSISSIPPI CANAL AROUND THE LOWER RAPIDS OF ROCK RIVER AT MILAN, ILLINOIS.

REPORT OF MAJ. JAS. L. LUSK, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Operating snag boats and dredge boats on Upper Mississippi River.
2. Mississippi River between mouth of Missouri River and St. Paul.
3. Operating and care of Des Moines Rapids Canal and dry dock.
4. Operating and care of Illinois and Mississippi Canal around the lower rapids of Rock River at Milan, Illinois.
5. Operating and care of Galena River improvement, Illinois.
6. Harbor at La Crosse, Wisconsin.

EXAMINATIONS AND SURVEYS.

7. Mississippi River inner harbor at Lake City, Minnesota.
8. Mississippi River at Moline, Illinois.
9. Mississippi River, east bank from Quincy, Illinois, to Sny levee.
10. Mississippi River at Quincy Harbor and Bay, Illinois.
11. Rock River, Illinois.

United States Engineer Office,
Rock Island, Ill., July 11, 1904.

General: I have the honor to transmit the annual report on improvement work in this district for fiscal year ending June 30, 1904.

Very respectfully, your obedient servant,

Jas. L. Lusk,
Major, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

Y 1.

OPERATING SNAG BOATS AND DREDGE BOATS ON UPPER MISSISSIPPI RIVER.

The work performed under this appropriation consists chiefly in the removal of snags, wrecks, rocks, and other obstructions to navigation. The operations extend from Minneapolis to the mouth of the Missouri River, a distance of about 670 miles, following the low-water channel.

There belongs to this work the snag boat *Col. A. Mackenzie*, built in 1900, but dredges, drill boats and tenders are borrowed from other works when required. The general improvement of the river has so reduced the extent of caving banks (which are the principal source of snags) that but one snag boat is needed.

The details of work accomplished are given in the appended report of Principal Assistant Engineer C. W. Durham.

The total tonnage of the river between Falls of St. Anthony and mouth of Missouri River for the calendar year 1903 was, approximately, 4,545,129 tons, and the ton-miles 979,951,901. This includes logs and lumber.

Money statement.

June 30, 1904, amount drawn from Treasury under permanent appropriation	[a]$25,090.00
June 30, 1904, amount expended during fiscal year	25,090.00
July 1, 1904, amount available under permanent appropriation of August 11, 1888, for fiscal year ending June 30, 1905	25,000.00

ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By act approved March 2, 1867	$96,000
By allotment from appropriation of July 25, 1868	26,000
By allotment from appropriation of 1869	35,640
By act approved—	
July 11, 1870	36,000
March 3, 1871	42,000
June 10, 1872	42,000
March 3, 1873	25,000
June 23, 1874	25,000
March 3, 1875	25,000
August 14, 1876	30,000
June 18, 1878	41,500
March 3, 1879	20,000
June 14, 1880	8,000
March 3, 1881	25,000
By act passed August 2, 1882	25,000
By act approved August 5, 1886	22,500

By act of August 11, 1888, for fiscal year ending—	
June 30, 1889	$25,000
June 30, 1890	25,000
June 30, 1891	25,000
June 30, 1892	25,000
June 30, 1893	25,000
June 30, 1894	25,000
June 30, 1895	25,000
June 30, 1896	25,000
June 30, 1897	25,000
June 30, 1898	25,000
June 30, 1899	25,000
June 30, 1900	24,944
June 30, 1901	25,000
June 30, 1902	25,000
June 30, 1903	25,000
June 30, 1904	25,000
Total	924,584

STATISTICS OF COMMERCE AND NAVIGATION.

Lumber.—The most important business carried on in connection with the navigation of the upper Mississippi River and its principal tributaries is the lumber trade, which in 1903 gave employment to 60 towboats, valued at about $500,000. Along the river from Minneapolis to St. Louis 36 sawmills were operated by 32 wholesale firms, having an invested capital of about $20,000,000. Their manufactures of white pine in 1903 were: Lumber, 863,963,000 feet B. M.; shingles, 146,765,000; lath, 115,257,000, and of hemlock lumber, 6,469,000 feet B. M. In addition to the manufacturers there are a great many retail or distributing firms.

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[a] Ninety dollars was received from sale of condemned property and deposited in the Treasury to the credit of this appropriation.

Lumber manufacture, upper Mississippi River Valley, 1903.

[Value, about $37,500,000.]

Locality.	Lumber.	Shingles.
	Feet B. M.	*Number.*
Above Minneapolis	558,025,000	155,023,000
Minneapolis	442,535,000	39,714,000
St. Paul to Missouri River	339,801,000	89,565,000
St. Croix River	256,340,000	57,456,000
Chippewa River	141,889,000	33,455,000
Black River	22,740,000	17,566,000
Total	1,761,330,000	392,779.000

The larger part of the above was floated for greater or less distance on the Mississippi River, either as logs or lumber.

Statement of distribution of white pine lumber manufacture along the upper Mississippi River from Minneapolis to Missouri River, in 1903.

Locality.	Lumber.	Shingles.	Lath.
	Feet B. M.	*Number.*	*Number.*
Minneapolis	442,535,000	39.714,000	75,401,000
Hastings	6,000,000	500,000	1,500,000
Red Wing	8,200,000	2,250,000	2,681,000
Winona	74,440,000	34,120,000	28,975,000
La Crosse	21,800,000	17,566,000	4,462,000
Guttenberg	13,729,000	2,825,000	2,281,000
Dubuque	38,000,000	3,800,000	4,700,000
Bellevue	5,000,000	....	1,750,000
Clinton	53,006,000	9,690,000	9,047,000
Davenport	37,701,000	4,887,000	7,576,000
Rock Island	58,000,000	5,553,000	15,919,000
Muscatine	46,884,000	6,516,000	11,551,000
Burlington	26,000,000	4,200,000	12,000,000
Fort Madison	18,641,000	9,894,000	3,914,000
Keokuk	14,000,000	5,250,000	3,500,000
Total	863,936,000	146,765,000	115,257,000

Steamboats and freight.—There were employed, between St. Paul and St. Louis during 1903, 59 raft boats, 23 packets, 33 towboats, 16 ferryboats, 47 pleasure boats, and 20 Government boats; in all, 198 steamboats, with a gross tonnage of 18,964 tons.

The principal steamboat lines on the upper Mississippi River are the Diamond Jo, the Eagle, the Carnival City, and the Acme packet companies. The number of passengers carried by these packet lines in 1903 was 1,408,593. The quantity of freight carried by all boats, including the rock and brush loaded on barges and used in Government work, and also including logs and lumber floated down the stream, is shown in the following table, together with the ton-miles and valuation:

Upper Mississippi River freight statement for 1903.

Designation.	Tons.	Ton-miles.	Valuation.
Logs	3,110,271	808,670,460	$13,822,980
Rafted lumber, shingles, etc	363,458	145,989,957	4,736,628
Miscellaneous freight	825,375	22,478,556	5,860,661
United States material	246,025	2,812,928	184,519
Total	4,545,129	979,951,901	24,604,788

NOTE.—The above statement shows a great increase in tonnage over that reported for 1902, due in great part to the including of strictly local commerce and United States material, which in that year were not considered in the freight statements.

The average tonnage for twenty-six years is 4,615,376, and the average valuation $16,714,523.

The following table affords a view of the amount of navigation at various localities on the upper Mississippi River for the year 1903:

List of steamboats, barges, and rafts passing through various bridges.

Location of bridge.	Miles from St. Paul.	Steamboats.	Barges.	Rafts.
St. Paul Park	11	1,569	(*a*)	563
Hastings	28	1,774	191	464
Prescott	30	2,900	(*a*)	(*a*)
Reeds	78	1,539	647	742
Winona	116	2,742	943	920
La Crosse	143	2,286	735	441
Dubuque	265	1,389	814	333
Sabula	310	1,249	756	285
Clinton	327	1,826	263	(*a*)
Rock Island	363	1,891	344	243
Keithsburg	417	465	179	86
Burlington	441	1,841	626	120
Fort Madison	462	1,183	233	82
Keokuk	484	1,354	595	*b* 24
Quincy	521	1,229	840	25
Hannibal	540	479	176	6
Louisiana	568	973	265	(*a*)
Alton	652	1,571	283	5

a No record. *b* Partial record.

Internal revenue for the year ending December 31, 1903, collected in districts bordering on the upper Mississippi River.

District.	Office.	Amount.
Minnesota	St. Paul	$1,449,142.56
Second Wisconsin	Madison	800,027.40
Third Iowa	Dubuque	393,360.65
Fourth Iowa	Burlington	465,935.64
Fifth Illinois	Peoria	33,144,737.19
Eighth Illinois	Springfield	11,639,913.27
Thirteenth Illinois	East St. Louis	701,577.35
First Missouri	St. Louis	8,174,563.22
Total		56,769,257.28

Customs revenue and tonnage for the year ending December 31, 1903.

Port.	Collections.	Tonnage enrolled.	Vessels.
St. Paul, Minn	$816,731.85	3,798	51
La Crosse, Wis	14.55	2,908	40
Dubuque, Iowa	14,914.73	3,678	25
Rock Island, Ill	17.70	5,638	106
Burlington, Iowa	71.69	2,207	35
St. Louis, Mo. *a*	2,164,371.08	62,592	150
Total	2,996,121.60	80,821	407

a Only a part of the St. Louis statement is applicable to the upper Mississippi.

List and dimensions of steamers navigating the Mississippi River between St. Louis and St. Paul during the year 1903.

Name of vessel.	Gross tonnage.	Length.	Width.	Depth.	When built.	Where built.
		Feet.	*Feet.*	*Feet.*		
A. J. Whitney	72	89.8	18.0	3.2	1880	Rock Island, Ill.
Ada	15	68.0	12.7	3.0	1885	Keokuk, Iowa.
Albatross[a]	8	36.0	8.0	3.0	1902	Muscatine, Iowa.
Alert	100	115.0	19.6	3.8	1881	Stillwater, Minn.
Alice[a]	8	36.0	6.0	4.0	1901	Davenport, Iowa.
Alice D	25	60.0	12.0	5.7	1887	Stillwater, Minn.
Altonian	92	102.0	28.0	4.0	1880	Cincinnati, Ohio.
Arctic	23	50.0	17.5	3.3	1891	Rock Island, Ill.
Artemus Gates	90	85.0	18.0	3.0	1896	Clinton, Iowa.
B. Hershey	170	125.3	27.5	3.9	1877	Rock Island, Ill.
Bald Eagle	937	206.5	34.2	6.0	1898	Madison, Ind.
Bart E. L. Molo	35	56.0	13.8	10.7	1895	Lyons, Iowa.
Beaver	20	65.0	11.0	3.6	1897	La Crosse, Wis.
Beder	14	50.0	14.0	2.4	1891	Moline, Ill.
Belle of Calhoun	451	180.9	36.4	4.7	1895	St. Louis, Mo.
Bertha	7	25.0	7.0	4.0	1892	Winona, Minn.
Birdie B.[a]	8	37.0	7.5	3.0	1902	Lyons, Iowa.
Black Hawk	18	52.0	8.9	2.6	1889	Stillwater, Minn.
Bonnie Belle[a]	10	44.0	8.2	3.0	1902	Bellevue, Iowa.
Bun Hersey	35	91.5	20.4	3.6	1883	Stillwater, Minn.
C. W. Cowles	180	128.5	26.6	4.0	1881	Madison, Ind.
Cantonia	75	92.0	20.0	4.6	1891	Rock Island, Ill.
Celeste[a]	18	60.0	10.6	3.0	1902	Clinton, Iowa.
Chancy Lamb	194	136.0	28.8	4.5	1892	Dubuque, Iowa.
Chas. Schraeder[a]	9	45.0	8.0	3.0	1903	Lyons, Iowa.
City of Hudson	61	71.0	12.7	2.9	1899	Stillwater, Minn.
City of Nauvoo	56	89.0	21.0	3.6	1885	Rock Island, Ill.
City of Warsaw	178	100.0	25.4	3.1	1895	Jeffersonville, Ind.
City of Winona	212	137.0	29.1	4.6	1882	Dubuque, Iowa.
Clara[a]	8	35.0	12.0	2.5	1902	Moline, Ill.
Clipper	10	40.0	11.0	2.4	1899	Buffalo, Iowa.
Coal Bluff	175	124.0	22.0	4.5	1881	Ohio River.
Col. A. Mackenzie	264	160.0	33.0	5.0	1900	Jeffersonville, Ind.
Columbia	222	166.5	33.6	5.0	1897	Clinton, Iowa.
Commodore	32	70.0	18.0	3.0	1898	Lake City, Minn.
Cruiser[a]	8	41.0	8.0	2.6	1901	Clinton, Iowa.
Curlew	50	79.0	20.0	3.4	1902	Rock Island, Ill.
Cyclone	138	121.0	22.6	4.0	1891	Stillwater, Minn.
Dora[a]	6	28.5	7.0	3.5	1902	Rock Island, Ill.
Dubuque	748	257.2	40.6	6.1	1879	Cincinnati, Ohio.
E. Douglas	107	112.3	24.2	4.6	1896	Wabasha, Minn.
E. Rutledge	212	132.7	30.5	4.7	1892	Rock Island, Ill.
Eagle Point	50	96.0	22.0	3.0	1884	Dubuque, Iowa.
Eclipse	148	124.9	24.6	4.1	1882	Leclaire, Iowa.
Edith[a]	3	21.0	5.5	3.0	1892	Quincy, Ill.
Edna	14	44.0	12.5	2.5	1899	Rock Island, Ill.
Eleanor	15	50.0	9.0	3.7	1902	Lyons, Iowa.
Elsie	15	67.0	13.0	3.0	1889	Jeffersonville, Ind.
Emily	15	67.0	12.0	3.0	1889	Keokuk, Iowa.
Emma B.[a]	5	40.0	7.0	2.4	1901	Muscatine, Iowa.
Emma L	7	35.0	7.0	2.5	1902	Buffalo, Iowa.
Eva[a]	5	32.0	7.0	2.5	1902	Bellevue, Iowa.
Everett	85	110.0	19.0	3.5	1886	South Stillwater, Minn.
F. Weyerhaeuser	216	140.0	31.0	4.5	1893	Rock Island, Ill.
Flirt	8	36.0	7.6	3.0	1902	Clinton, Iowa.
Flying Eagle	142	133.5	29.6	4.8	1888	Rock Island, Ill.
Frank	31	78.4	22.4	3.0	1879	La Crosse, Wis.
Fred Swain	124	142.0	28.3	4.5	1900	Stillwater, Minn.
Frentress[a]	58	70.0	23.0	3.4	1903	East Dubuque, Ill.
Frontenac	146	138.9	29.8	5.0	1896	Wabasha, Minn.
Fury	100	100.0	19.6	3.8	1881	Dubuque, Iowa.
Gardie Eastman	100	112.0	22.0	3.7	1903	Rock Island, Ill.
G. A. Mower	29	77.0	12.0	2.6	1886	Arcola, Minn.
Gate City	60	73.8	13.8	3.5	1900	Winona, Minn.
Gazelle	87	124.0	23.2	3.9	1901	Wabasha, Minn.
Georgie S	54	82.5	18.5	3.5	1884	Savanna, Ill.
Glenmont	92	128.0	24.6	4.6	1885	Dubuque, Iowa.
Good Luck	43	90.5	18.5	3.0	1890	Beef Slough, Wis.
Gracie Kent	74	111.0	20.0	4.0	1897	Stillwater, Minn.
Gypsey	55	78.3	15.6	4.0	1891	Leclaire, Iowa.
H. A. Barnard	20	60.0	14.0	2.5	1898	Moline, Ill.
H. C. Brockman	75	90.6	22.6	3.8	1895	Rock Island, Ill.
H. W. B	55	82.0	20.0	3.6	1903	Muscatine, Iowa.
Harrie Reid	58	85.0	18.0	3.5	1882	Madison, Ind.
Hattie Darling	14	60.0	14.0	3.6	1893	Rock Island, Ill.
Hawkeye[a]	7	28.6	6.6	4.0	1901	Davenport, Iowa.
Helen Blair	213	160.4	29.0	5.3	1897	Marietta, Ohio.
Hennepin	40	74.0	17.0	3.0	1897	Davenport, Iowa.

[a] Gasoline.

List and dimensions of steamers navigating the Mississippi River between St. Louis and St. Paul during the year 1903—Continued.

Name of vessel.	Gross tonnage.	Length.	Width.	Depth.	When built.	Where built.
		Feet.	*Feet.*	*Feet.*		
Henrietta	153	130.0	24.0	4.3	1879	Stillwater, Minn.
Hiawatha	191	130.0	30.0	4.0	1882	Dubuque, Iowa.
Horace H	40	83.7	13.5	2.7	1881	Wabasha, Minn.
Ianthe	22	66.5	12.7	3.8	1902	Stillwater, Minn.
Ida Belle	5	25.0	7.0	3.0	1902	Rock Island, Ill.
Ida Mc	33	62.2	16.1	3.5	1894	Chester, Ill.
Illinois	402	139.0	26.6	4.8	1901	Quincy, Ill.
Irene M	11	50.0	9.0	2.5	1897	Sabula, Iowa.
Iris	15	61.0	12.0	3.0	1884	Keokuk, Iowa.
Isaac Staples	147	137.8	30.4	4.7	1878	Stillwater, Minn.
Island Queen[a]	10	33.0	10.0	3.0	1901	Davenport, Iowa.
J. S	292	175.0	33.0	5.5	1901	Jeffersonville, Ind
J. J. Hill	286	130.0	25.3	4.5	1902	Hastings, Minn.
J. O. Henning	26	65.0	20.0	3.0	1878	Hudson, Wis.
J. T. Davis	124	122.5	32.5	4.1	1880	Grafton, Ill.
J. W. Vansant	228	140.0	30.0	5.4	1890	Leclaire, Iowa.
J. M. Richtman	209	121.0	23.5	3.9	1899	Sterling Island, Mo.
Jacob Richtman	469	160.0	32.0	5.0	1898	Do.
Jack Frost	350	165.0	30.0	5.4	1881	Jeffersonville, Ind.
Jessie B	78	121.0	21.6	4.3	1891	Dubuque, Iowa.
Jessie Bill	60	90.9	15.0	3.5	1882	Wabasha, Minn.
Josephine[a]	8	32.0	6.5	4.0	1903	Moline, Ill.
Josie	237	146.2	28.6	4.8	1873	Madison, Ind.
Julia B	25	79.0	8.4	8.0	1899	Stillwater, Minn.
Juniata	98	134.0	22.5	4.2	1889	Winona, Minn.
King Philip[a]	8	32.0	7.0	4.0	1903	Moline, Ill.
Kit Carson	237	138.6	29.2	4.0	1880	South Stillwater, Minn.
Lark[a]	5	38.0	7.9	3.0	1902	Oquawka, Ill.
Lily	507	178.0	28.0	4.5	1875	Louisville, Ky.
Lion	38	101.5	19.5	2.6	1875	Lyons, Iowa.
Lizzie Gardner	82	143.6	21.0	3.6	1871	Cincinnati, Ohio.
Lone Star	48	84.0	20.0	5.0	1890	Rock Island, Ill.
Lora	257	150.0	30.0	4.5	1900	Stillwater, Minn.
Lorelei[a]	7	28.0	8.0	3.0	1902	Rock Island, Ill.
Lorraine[a]	10	43.0	7.0	3.0	1901	Do.
Lotus	28	78.0	16.0	3.0	1893	Do.
Lotus[a]	9	38.0	7.0	3.6	1901	La Crosse, Wis.
Louise	15	68.0	12.7	3.0	1885	Keokuk, Iowa.
Lucia	15	68.0	12.8	3.0	1885	Do.
Lydia Van Sant	93	102.0	23.0	4.0	1898	Leclaire, Iowa.
Mac	35	73.0	16.0	3.0	1891	Rock Island, Ill.
Mamie B	8	54.4	8.8	3.0	1900	Lansing, Iowa.
Marie J	76	100.0	20.0	4.4	1896	Helena, Ark.
Mars	132	120.0	18.0	4.0	1902	Lyons, Iowa.
Mary B	90	95.4	22.9	4.2	1890	Lake City, Minn.
Mary Bell	8	46.0	8.2	2.2	1902	Maquoketa, Iowa.
Mary Gwen	7	38.0	8.0	2.5	1902	Clinton, Iowa.
Mary K	37	61.8	14.0	3.0	1902	Lyons, Iowa.
Mary Mc[a]	12	45.0	8.5	3.5	1900	La Crosse, Wis.
May Flower	46	66.9	22.4	3.9	1888	Leclaire, Iowa.
Mayott	9	45.0	9.5	4.0	1894	St. Paul, Minn.
Maze[a]	10	32.0	8.5	4.0	1903	Moline, Ill.
Megiddo	250	175.0	33.0	5.0	1901	Lyons, Iowa.
Midget	64	70.4	22.0	3.5	1891	Leclaire, Iowa.
Mignon	10	36.0	8.5	4.0	1897	Dubuque, Iowa.
Mina[a]	10	32.0	8.5	4.0	1903	Moline, Ill.
Minnie Schneider	32	70.0	15.2	4.6	1889	Galena, Ill.
Monarch	43	71.2	14.3	3.4	1882	Quincy, Ill.
Mountain Belle	193	140.0	27.0	4.8	1869	Pittsburg, Pa.
Musser	163	137.0	24.0	4.6	1886	Leclaire, Iowa.
Nautilus	10	48.8	12.5	4.1	1899	Burlington, Iowa.
Never Mind[a]	7	38.0	8.0	2.5	1903	Clinton, Iowa.
Nina Dousman	24	40.0	9.0	4.8	1888	Prairie du Chien, Wis.
Ollie Bell	10	50.0	9.6	3.5	1901	St. Paul, Minn.
Ondine	14	45.0	12.0	3.0	1899	Rock Island, Ill.
Ondine	12	50.0	10.0	3.0	1901	Do.
Ottumwa Belle	81	104.0	22.0	4.0	1895	Canton, Mo.
Outoga	19	53.8	9.2	4.8	1895	Nyack, N. Y.
Outing	21	73.0	13.5	3.8	1897	St. Paul, Minn.
Park Bluff	96	107.3	22.7	3.5	1884	Rock Island, Ill.
Pastime	16	44.5	8.0	3.0	1899	Winona, Minn.
Pathfinder	62	85.0	20.0	3.6	1898	Clinton, Iowa.
Pearl[a]	26	46.6	14.0	4.0	1903	Davenport, Iowa.
Pearl City[a]	8	34.0	9.0	2.5	1902	Bellevue, Iowa.
Peoples Ferry	183	125.0	34.6	4.3	1889	Madison, Ind.
Percy Swain	115	129.8	19.7	3.5	1882	Reads Landing, Minn.
Phil Sheckel	99	111.5	24.8	4.2	1897	Wabasha, Minn.
Pinta[a]	8	43.6	8.7	3.0	1890	Louisiana, Mo.

[a] Gasoline.

List and dimensions of steamers navigating the Mississippi River between St. Louis and St. Paul during the year 1903—Continued.

Name of vessel.	Gross tonnage.	Length.	Width.	Depth.	When built.	Where built.
		Feet.	*Feet.*	*Feet.*		
Polar Wave	150	146.0	25.7	5.0	1885	Jeffersonville, Ind.
Prescott	55	90.0	18.0	3.4	1903	Rock Island, Ill.
Quincy	806	264.7	42.0	6.8	1896	Dubuque, Iowa.
R. D. Kendall	82	92.0	23.5	3.5	1896	Rock Island, Ill.
Rambler	10	35.0	10.0	3.0	1903	Moline, Ill.
Ravenna	164	125.6	22.0	3.5	1888	Stillwater, Minn.
Raven[a]	8	32.0	9.0	3.0	1903	Davenport, Iowa.
Remora	49	86.6	22.2	3.4	1872	Keithsburg, Ill.
Roann	39	70.0	10.0	3.5	1899	Lyons, Iowa.
Robert Harris	36	68.2	14.0	4.5	1872	Burlington, Iowa.
Runabout[a]	10	40.0	9.0	3.0	1901	Clinton, Iowa.
Ruth[a]	9	34.0	9.0	3.0	1901	Do.
Ruth	35	75.0	17.0	3.0	1895	Keokuk, Iowa.
Safety[a]	6	42.8	10.0	2.1	1903	New Boston, Ill.
St. Croix	8	51.0	9.0	4.0	1898	Stillwater, Minn.
St. Paul	833	302.0	69.4	6.2	1883	Jeffersonville, Ind.
Satellite	60	86.0	20.0	3.4	1890	Rock Island, Ill.
Saturn	189	145.5	30.0	4.0	1901	Do.
Schley[a]	10	34.0	7.6	4.0	1902	Davenport, Iowa.
Scotia	31	100.5	13.4	3.0	1889	La Crosse, Wis.
Sidney	617	221.3	35.5	5.5	1880	Wheeling, W. Va.
Silver Crescent	125	123.3	22.9	3.9	1882	Clinton, Iowa.
Spread Eagle	691	225.0	35.0	6.0	1892	Jeffersonville, Ind.
Stella	15	61.0	12.0	3.0	1883	Keokuk, Iowa.
Summer Girl[a]	8	40.0	7.4	3.0	1898	Clinton, Iowa.
Swan[a]	8	45.0	6.6	3.0	1900	Do.
Swannanoa[a]	14	55.1	9.4	3.5	1901	Do.
T. J. Robinson	155	100.0	29.0	5.0	1875	Do.
Teal	48	85.0	19.6	4.0	1893	Dubuque, Iowa.
Ten Broeck	148	130.0	26.0	3.9	1882	Baytown, Minn.
Tri-City	12	45.0	8.8	3.0	1903	Clinton, Iowa.
Two Brothers	29	63.0	20.0	2.8	1894	North Hudson, Wis.
Uranus[a]	11	51.0	11.1	3.1	1897	Clarksville, Mo.
Viola	21	53.0	10.0	4.0	1899	Maquoketa, Iowa.
Vivian	75	90.0	21.0	3.5	1896	Lyons, Iowa.
Vixen	100	100.0	19.5	3.8	1881	Dubuque, Iowa.
Wabasha	44	80.0	22.0	2.9	1894	Wabasha, Minn.
Wanderer	84	100.0	21.0	3.6	1897	Clinton, Iowa.
West Rambo	105	107.0	22.0	3.6	1884	Leclaire, Iowa.
Wigwam[a]	8	38.0	8.0	3.0	1902	Clinton, Iowa.
Youngster[a]	12	50.1	8.8	3.0	1900	Do.
Zalus Davis	46	90.0	18.6	3.4	1894	Dubuque, Iowa.

[a] Gasoline.

Summary of expenditures for operating snag boats and dredge boats on upper Mississippi River for fiscal year ending June 30, 1904.

Month.	Office expenses, superintendence, and contingencies.	Care, repair, and operating snag boats and dredge boats.						Grand total.
		Labor.	Subsistence.	Fuel.	Expense.	Repairs.	Total.	
1903.								
July	$200.00	$1,659.02	$527.14	$268.80	$196.69		$2,651.65	$2,851.65
August		5.00	236.19	451.05	367.52	$35.95	1,095.71	1,095.71
September	150.00	2,014.52	469.40	1,303.38	124.18	2.00	3,913.48	4,063.48
October	300.00	3,176.18	331.57	929.30	343.96	30.75	4,811.76	5,111.76
November	154.19	462.04	79.78	250.90	10.15	10.00	812.87	967.06
December	350.00							350.00
1904.								
January		480.00					480.00	480.00
February		240.00				297.42	537.42	537.42
March	150.00	696.25				869.29	1,565.54	1,715.54
April	14.66	1,416.02	420.77	170.00	206.76	759.25	2,972.80	2,987.46
May		1,352.50	248.78	603.27	180.14		2,384.69	2,384.69
June	100.00	1,400.00	239.98	370.82	372.73	61.70	2,445.23	2,545.23
Total	1,418.85	12,901.53	2,553.61	4,347.52	1,802.13	2,066.36	23,671.15	25,090.00

REPORT OF MR. C. W. DURHAM, PRINCIPAL ASSISTANT ENGINEER.

United States Engineer Office,
Rock Island, Ill., July 1, 1904.

Major: I have the honor to present my report on the operations of snag boats and dredge boats on the upper Mississippi River for the fiscal year ending June 30, 1904.

Operations of snag boat Col. A. Mackenzie.—The *Mackenzie* was employed from July 1 to November 5, 1903, in removing snags and other obstructions, placing buoys, making surveys, and otherwise assisting the interests of navigation between Minneapolis and the mouth of the Missouri River.

Leaving Rock Island (mile 363) on July 6, she proceeded up river and arrived at St. Paul on the 15th; returning down river the same day, she reached St. Louis (mile 676) on the 29th. She left St. Louis August 1, going up river, and arrived at St. Paul September 14; turning back, she again landed at St. Louis September 29.

On the above-mentioned trip many buoys were placed; the steamer *St. Paul*, in distress, was assisted to port and her passengers transferred, and dredge *Vulcan* was towed from Fountain City to Guttenberg, 159 miles.

After an inspection of her boilers, the *Mackenzie* returned up river, leaving St. Louis October 2, and reaching St. Paul October 15. An inspection trip was then made, with Colonel Ernst, Corps of Engineers, division engineer, Northwestern Division, on board, the boat leaving St. Paul October 16 and arriving at St. Louis October 24.

Leaving St. Louis October 27, the *Mackenzie* proceeded up river, reaching Rock Island on October 30, at which point she turned around and was laid up for the winter in the Des Moines Bapids Canal above the Middle lock on November 5.

In 1904, the *Mackenzie*, having been repainted and otherwise repaired, left her winter quarters on April 11 for St. Louis (mile 676), arriving at that port on the 14th. After taking on stores and fuel she proceeded up river on the 18th, reaching Rock Island (mile 363) on the 29th, where she lay until May 2. On April 11 and 12 the sheer boom at the lower end of the Des Moines Rapids Canal was placed in position, and 11 buoys were reset between Rock Island and Burlington (mile 440).

The snag boat left Rock Island May 2, reached St. Paul on the 12th, and, returning down river on an inspection trip, reached St. Louis on the 26th and remained there until June 7.

Leaving St. Louis on June 7, she reached St. Paul June 30. During June a survey of Galena River and Harris Slough was made.

Summary of operations of snag boat Col. A. Mackenzie for fiscal year ending June 30, 1904.

Snags removed	264
Stumps destroyed	210
Leaning trees pulled back	196
Leaning trees felled	2,050
Surveys, days	2
Buoys placed	28
Steamboats assisted	1
Mooring chains placed	5
Miles run	6,699

Operations of dredge Vulcan.—On July 16, 1903, the *Vulcan*, with towboat *Elsie* as tender, commenced removing certain dams, or parts of dams, in the vicinity of La Moille, which were obstructing navigation and interfering with the carrying out of the adopted project for improvement. The obstructions were removed to a depth of 5 feet at low water. This work was completed September 10, and resulted in the removal of 460 feet of Dam 24 (mile 125), 400 feet of Dam 26, 425 feet of Dam 23, 200 feet of Dam 21, the whole of Dam 22 (570 feet), and 250 feet of Dam 3, at Dresbach Island (mile 138). The lengths of the shortened dams are now as follows: Dam 24, 250 feet; Dam 26, 220 feet; Dam 23, 205 feet; Dam 21, 425 feet. About 150 linear feet of the shore protection at the head of Island 188, which the river had cut behind and detached, was cast back on the bank. To facilitate the construction of shore protection in miles 137 and 138, about 60 snags were removed by the dredge. On September 11 the *Vulcan* was towed to the head of Island 46 by the *Mackenzie*, and about 400 linear feet of wrecked shore protection at that locality was cast toward shore, and about 80 feet of the shore protection on the west bank, opposite, was treated in the same manner. On September 16 the dredge was taken in tow by the *Mackenzie* and delivered, with towboat *Emily*, at Guttenberg September 19. The *Vulcan* was then employed until the 28th in removing about 300 feet of the outer end of Dam 15 (mile 234).

The cost of the above-mentioned work, exclusive of plant charges, was $3,271.71.

Repairs to dredge Hecla.—Some repairs to this dredge were made at the Des Moines Rapids Canal during March and April, 1904. The cost of these repairs was $1,157.93.

Summary of expenditures.

Snag boat *Col. A. Mackenzie*, operating	$19, 241. 51
Operations of dredge *Vulcan* in removing obstructions	3, 271. 71
Repairs to dredge *Hecla*	1, 157. 93
Superintendence and office expenses	1, 418. 85
Total	25, 090. 00

Very respectfully, your obedient servant,

C. W. Durham,
Principal Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

Y 2.

IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN MOUTH OF MISSOURI RIVER AND ST. PAUL.

The work performed under this appropriation consists chiefly in the permanent improvement of through navigation, but improvements at harbors and other localities are frequently made under allotments contained in the various acts of Congress.

The original condition of the channel between the Missouri River and St. Paul was such that at low stages the larger boats were unable to proceed farther up the river than La Crosse or Winona, while at extreme low water navigation was impeded at points much lower. The original project for improvement, which has undergone no material change, was adopted in 1878, and contemplates the closure of chutes, revetment of caving banks, and contraction of the channel by wing dams, so as to obtain a channel of a depth of 4½ feet at low water, to be eventually increased to 6 feet.

At the close of the fiscal year ending June 30, 1904, there had been expended $10,850,510.65, which has resulted in such an improved condition of the channel as to permit the passage of the largest boats at very low stages through to St. Paul. It may be proper to state that of the amount above mentioned, about $1,000,000 has been expended on harbor and levee work without much benefit to the main channel.

On July 1, 1903, there was unexpended $559,062.38. During the past year, for the improvement of through navigation, dam construction, shore protection, dredging, removal of rock, etc., have been carried on by hired labor and use of Government plant, between St. Paul and Bellevue (mile 288); at Rock Island Rapids (miles 349–363), and between Quincy (mile 521) and the Missouri River (mile 658); and by contract, between Bellevue and Le Claire (mile 348), and between Burlington (mile 442) and Hannibal (mile 540).

The balance available July 1, 1904, will be applied at such points as may seem most in need of improvement, by hired labor, between St. Paul and Bellevue, at Rock Island Rapids, and between Hannibal and the Missouri River (mile 658); by contract between Bellevue and Le Claire, and between Rock Island and Hamburg (mile 593).

GENERAL IMPROVEMENT.

St. Paul to Winona.—By hired labor and use of Government plant, improvement work was carried on in 1903 in vicinity of Wabasha (miles 81–82) and above Fountain City (miles 107–108). Seven wing dams were built and several dams were raised, repaired, and lengthened. In 1904, dredging was carried on at the bar at St. Paul, opposite Harriet Island, and in the vicinity of Minneiska (mile 100).

Winona to Wisconsin River.—In this district work was carried on by hired labor and use of Government plant in the vicinity of La Moille (miles 124 and 125), in the vicinity of Dresbach Island (miles 137–139), and below and opposite La Crosse (miles 147–148). Seventeen dams and 5,270 linear feet of shore protection were built, and a large number of dams and pieces of shore protection were repaired and lengthened. Rock for all work was furnished by the United States quarry at La Moille. Similar work was resumed in June, 1904, in the vicinity of Dresbach.

Wisconsin River to Bellevue.—Considerable dredging was performed in 1903 by U. S. hydraulic dredge *Hecla* in removing portions of two bars in Guttenberg channel (mile 231). With hired labor and Government plant operations were carried on in 1903 in and above Guttenberg channel (miles 224–233). Ten wing dams were built, and 6,240 linear feet of shore protection.

Bellevue to Le Claire.—Under contract with Fetter & Crosby work was commenced in May, 1904, in the vicinity of Island 283 (miles 319–321). Fair progress was made to end of fiscal year.

Rock Island Rapids.—Excavation and removal of rock from the channel (miles 348–364) were carried on during 1903 by hired labor at Campbells Cabin, St. Louis, Crab Island, Sycamore, and Smiths chains. The quantity of ledge rock removed was 6,425 cubic yards. In May, 1904, operations were resumed at Lower Chain, and in June at Smiths Chain.

Rock Island to Burlington.—Under two contracts with Fetter & Crosby, work was carried on in 1903 in the vicinity of Burlington (miles 441–442), at Johnsons Island (miles 423–424), at Offermans Island (miles 365–368), at Smiths Island (miles 370–371), and below Montpelier (mile 378). Twelve dams were built. In 1904 four dams were built below Montpelier.

Burlington to Hannibal.—Under two contracts with A. Kirchner, operations were carried on in 1903 in the vicinity of Dallas (miles 452–459); at Ortons Island (mile 525); at Marion City (mile 530), and at Whitneys and Armstrongs bars (miles 532–538). Six dams and 1,010 linear feet of shore protection were built and several dams were repaired.

In May, 1904, operations were resumed and carried on to end of fiscal year. Several pieces of shore protection between Canton and Quincy were raised to top of bank, and three wing-dams were built—one at Whitneys bar and the others in the vicinity of Quincy.

Considerable dredging was done at Whitneys bar by U. S. dredge *Phoenix* in 1903.

Hannibal to mouth of Missouri River.—In this district work was carried on in 1903, by hired labor and Government plant, opposite Hannibal (miles 540–541); opposite Louisiana (mile 558), and in the vicinity of Sterling and Stag islands (miles 600–604). Four dams and 1,800 linear feet of shore protection were built.

SPECIAL WORK.

Warsaw to Quincy Levee.—This levee was broken in 21 places by the disastrous flood of June, 1903, and the entire country between Warsaw and Quincy from the levee to the bluffs was under water. The U. S. dredge *Phoenix* was employed for a short time in closing one of the breaks in the Indian Grave district. A detailed account of this flood and the resultant damage is given in the appended report of Mr. M. Meigs, U. S. civil engineer.

Money statement.

July 1, 1903, balance unexpended	$10,999.30
June 30, 1904, amount expended during fiscal year	716.59
July 1, 1904, balance unexpended	10,282.71

ABSTRACT OF ALLOTMENTS.

By sundry civil act, approved—	
March 2, 1895	$85,500
June 4, 1897	5,000
March 3, 1899	5,000
By river and harbor act, approved June 13, 1902	10,000
Total	105,500

Flint Creek to Iowa River Levee.—This levee was not broken by the flood of June, 1903. An inspection made in December, 1903, shows that considerable repair work is desirable.

Money statement.

July 1, 1903, balance unexpended	$1,070.84
June 30, 1904, amount expended during fiscal year	427.32
July 1, 1904, balance unexpended	643.52

ABSTRACT OF ALLOTMENTS.

By sundry civil act of—	
March 2, 1895	$85,000
June 3, 1896	75,000
June 4, 1897	50,000
July 1, 1898	40,000
Total	300,000

Bar at Quincy.—The improvement work carried on at Quincy Bay and steamboat landing is now consolidated under the head of bar at Quincy. Prior to this consolidation the sum of $129,481.36 had been expended in dredging Quincy Bay under appropriations and allotments dating back to 1879, in which year the original project was made. United States hydraulic dredge *Hecla* was employed for a short time in the fall of 1903 and during May and June, 1904, in removing the bar. Some dredging was done in June, 1904, under contract with H. S. Brown.

Money statement.

July 1, 1903, balance unexpended	$26,819.02
June 30, 1904, amount expended during fiscal year	4,301.24
July 1, 1904, balance unexpended	22,517.78

ABSTRACT OF ALLOTMENTS.

By river and harbor act of June 30, 1896	$10,000
By sundry civil act of March 3, 1899	10,000
By river and harbor act of June 13, 1902	20,000
Total	40,000

Harbor of Refuge, below Davenport, Iowa.—In 1903 the dam at the head of the harbor was raised to crest elevation of 8 feet above low water. In June, 1904, the driving of piles and dredging were commenced.

Money statement.

July 1, 1903, balance unexpended	$15,000.00
June 30, 1904, amount expended during fiscal year	4,538.17
July 1, 1904, balance unexpended	10,461.83

ABSTRACT OF ALLOTMENTS.

By sundry civil act of March 3, 1899	$10,000
By river and harbor act of June 13, 1902	5,000
Total	15,000

Channel at Clinton, Iowa.—No work was done during the past year.

Money statement.

July 1, 1903, balance unexpended	$2,928.85
July 1, 1904, balance available	2,928.85

ALLOTMENT.

By sundry civil act of March 3, 1899	$25,000

Channel and harbor at Hannibal.—By hired labor and Government plant, in 1903, two wing dams were built opposite Hannibal, and a third was lengthened 450 feet. A small amount of dredging was done under contract.

Money statement.

July 1, 1903, balance unexpended	$15,000.00
June 30, 1904, amount expended during fiscal year	10,550.13
July 1, 1904, balance unexpended	4,449.87

ALLOTMENT.

By river and harbor act of June 13, 1902	$15,000

Harbor at Muscatine.—No work was done during the year.

Money statement.

July 1, 1903, balance unexpended	$10,000.00
July 1, 1904, balance unexpended	10,000.00

ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By river and harbor act of—	
March 3, 1879	$7,500
June 14, 1880	7,500
March 3, 1881	2,500
August 2, 1882	2,500
By sundry civil act of June 4, 1897	15,000
By river and harbor act of June 13, 1902	10,000
Total	45,000

The details of the above-mentioned improvements are given in the appended reports of assistants in local charge.

Commercial statistics accompany my report on operating snag boats and dredge boats on the upper Mississippi River.

Summary of expenditures for calendar year ending December 31, 1903, for improving Mississippi River from Missouri River to St. Paul.

St. Paul to Winona	$43,662.13
Winona to Wisconsin River	55,550.58
Wisconsin River to Bellevue	53,637.95
Bellevue to Leclaire	55.79
Rock Island Rapids	33,621.79
Rock Island to Burlington	42,800.81
Burlington to Hannibal	51,455.55
Hannibal to Missouri River	23,692.87
Surveys and gauges	4,476.50
Construction, care, and repair of plant	41,938.79
Flint Creek to Iowa River Levee	2,377.60
Harbor of refuge at North Pepin	4,578.22
Warsaw to Quincy Levee	2,297.68
Bar at Quincy	3,274.67
Fountain City Bay	963.15
Channel and harbor at Hannibal	10,550.13
Harbor of refuge below Davenport	3,595.40
Total	378,529.61

NOTE.—In the above statement the retained percentage on contracts, December 31, 1903, is included.

General statement showing net expenditures from the commencement of improvement in 1878 to June 30, 1904, under various heads of appropriation.

St. Paul to Des Moines Rapids	$1,597,500.00
Minneapolis to Des Moines Rapids	1,100,000.00
Des Moines Rapids to Illinois River	1,330,000.00
Ohio River to Minneapolis, applied to "between mouth of Missouri River and Minneapolis"	3,000,000.01
Ohio River to St. Paul, applied to "between mouth of Missouri River and St. Paul"	3,872,888.31
	10,900,388.32
Less amount transferred to work at Lock and Dam No. 2, Mississippi River, between Minneapolis and St. Paul, act of August 18, 1894	49,877.67
Total net expenditures	10,850,510.65
Balance July 1, 1904, Missouri River to St. Paul	557,974.28
Total appropriated	11,408,484.93

Net expenditures on various sections of the river, harbors, levees, etc., between Minneapolis and the Missouri River, from commencement of improvement to June 30, 1904.

Locality.	Distance.	Amount.	Per mile.
	Miles.		
St. Paul to Minneapolis		$59,113.46	
St. Paul to Prescott	30	670,998.44	$22,366
Prescott to Lake Pepin	26	338,219.92	13,008
Foot of Lake Pepin to Alma	11	467,357.22	42,487
Alma to Winona Bridge (Chicago and Northwestern)	28	677,184.95	24,185
Winona Bridge to La Crosse Bridge (Chicago, Milwaukee and St. Paul)	28	693,710.89	24,775
La Crosse Bridge to McGregor Bridge	64	655,497.37	10,242
McGregor Bridge to Dubuque Bridge (Illinois Central)	57	377,370.24	6,621
Dubuque Bridge to Clinton Bridge (Chicago and Northwestern)	62	391,722.84	6,318
Clinton Bridge to Leclaire	21	39,830.24	1,897
Rock Island Rapids	14	632,164.65	
Rock Island Bridge to Keithsburg Bridge	55	339,230.22	6,168
Keithsburg Bridge to Nashville	59	899,443.63	15,245
Keokuk Bridge to Quincy Bridge	37	549,244.66	14,844
Quincy Bridge to Clarksville	56	1,006,861.02	17,998
Clarksville to Cap au Gris	37	866,953.15	23,431
Cap au Gris to Illinois River	24	394,553.08	16,450
Illinois River to Missouri River	23	431,446.95	18,750
West St. Paul		15,000.00	
Harbors of refuge in Lake Pepin:			
At Bay City		1,000.00	
At Lake City[a]		21,290.62	
At Stockholm[a]		6,143.08	
At Kings Coulee		30,000.00	
At Pepin		14,000.00	
Fountain City Bay		1,500.00	
Harbor at La Crosse		5,000.00	
Vicinity of Prairie du Chien		30,000.00	
Harbors at Dubuque and East Dubuque[a]		25,000.00	
Ice harbor at Dubuque		10,937.80	
Channel and harbor at Clinton		22,071.15	
Harbor at Port Byron		5,000.00	
Harbor at Rock Island[a]		10,000.00	
Harbor of refuge at Davenport		4,538.17	
Harbor at Muscatine[a]		15,000.00	
Harbor at Burlington		5,000.00	
Harbor at Montrose		2,000.00	
Harbor at Quincy[a]		13,180.98	
Bar at Quincy		4,301.24	
Quincy Bay[a]		84,481.36	
Channel and harbor at Hannibal		10,550.13	
Harbor at Clarksville		15,000.00	
Hamburg Bay		10,000.00	
Flint Creek to Iowa River levee		299,356.48	
Warsaw to Quincy levee		95,217.29	
Sny Island levee		106,728.99	
Surveys, gauges, and meter work		227,432.06	
Snag boats, dredge boats, and wrecking		82,093.35	
Practical test of Adams flume		27,176.83	
Plant at estimated value		160,608.19	
Total		10,850,510.65	

[a] Amounts additional to those given above have been expended under special appropriations, as follows: Harbor at Stockholm, $25,000; Lake City Harbor, $20,000; La Crosse Harbor, $12,000; Dubuque and East Dubuque harbors, $41,000; ice harbor at Dubuque, $35,500; Guttenberg channel, $8,000; Rock Island Harbor, $12,000; Andalusia channel, $6,000; Muscatine Harbor, $20,000; Fort Madison Harbor, $24,100; Burlington channel and harbor, $30,000; Quincy Harbor, $15,000; Quincy Bay, $45,000; Hannibal channel and harbor, $45,000; Louisiana Harbor, $10,000; Alton Harbor, $108,000; vicinity of Alexandria, $16,000; La Crosse to Root River, $12,500; Rock Island Rapids, $1,166,650; Des Moines Rapids, $4,574,950; dry dock at Des Moines Rapids Canal, $125,000; total, $6,351,700.

The restoration of deteriorated works has been provided for from funds appropriated for general improvement, but this item has now become of such importance that a separate estimate of $40,000, based on the amount expended for repairs during the past fiscal year, is submitted for maintenance of improvement works.

Money statement.

July 1, 1903, balance unexpended		$559,062.38
Amount appropriated by sundry civil act of April 28, 1904		400,000.00
Amount received from sale of condemned property		862.58
		959,924.96
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$361,950.68	
For maintenance of improvement	40,000.00	
		401,950.68
July 1, 1904, balance unexpended		557,974.28
July 1, 1904, outstanding liabilities		12,837.63
July 1, 1904, balance available		545,136.65
July 1, 1904, amount covered by uncompleted contracts		43,451.42
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$1,000,000.00	
For maintenance of improvement	40,000.00	
		1,040,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

ABSTRACT OF APPROPRIATIONS.

St. Paul to Des Moines Rapids:	
By act approved—	
June 18, 1878	$250,000.00
March 3, 1879	100,000.00
June 14, 1880	150,000.00
March 3, 1881	200,000.00
By act passed August 2, 1882	250,000.00
By act approved—	
July 5, 1884 (general improvement)	250,000.00
July 5, 1884 (applied to harbor, Lake City)	15,000.00
August 5, 1886	382,500.00
Minneapolis to Des Moines Rapids:	
By act of August 11, 1888	600,000.00
By act of September 19, 1890	500,000.00
Des Moines Rapids to Illinois River:	
By act approved—	
June 18, 1878	100,000.00
March 3, 1879	40,000.00
June 14, 1880	100,000.00
March 3, 1881	175,000.00
By act passed August 2, 1882	200,000.00
By act approved—	
July 5, 1884	200,000.00
August 5, 1886	150,000.00
By act of August 11, 1888	200,000.00
By act of September 19, 1890	165,000.00
Ohio River to Minneapolis, applied to "between Missouri River and Minneapolis:"	
By act approved—	
July 13, 1892	600,000.00
March 3, 1893 (sundry civil)	866,666.67
August 18, 1894 (sundry civil)	866,666.67
March 2, 1895 (sundry civil)	866,666.67

Ohio River to St. Paul, applied to "between Missouri River and St. Paul:"	
By act of June 3, 1896	$200,000.00
By act of June 4, 1897 (sundry civil)	826,666.67
By act of July 19, 1897 (deficiency)	200,000.00
By act of July 1, 1898 (sundry civil)	826,666.67
By act of March 3, 1899 (sundry civil)	826,666.67
By act of June 6, 1900 (allotment)	150,000.00
Missouri River to St. Paul:	
By act approved—	
June 13, 1902	400,000.00
March 3, 1903 (sundry civil)	400,000.00
April 28, 1904 (sundry civil)	400,000.00
Received from sale of condemned property	862.58
Total	11,458,362.60
Less amount transferred to work at Lock and Dam No. 2, Mississippi River, between Minneapolis and St. Paul (act August 18, 1894)	49,877.67
	11,408,484.93

List of contracts in force July 1, 1904, for improvement work on Mississippi River, between mouth of the Missouri and St. Paul, Minn.

Name and residence of contractor.	Location of work.	Material in place.	Date of approval, of commencement of work and expiration of contract.
		Per cubic yard.	
Fetter & Crosby, La Crosse, Wis.	Building dams and shore protections, Bellevue to LeClaire.	Rock, $1.39; brush, 56 cents.	Approved Aug. 4, 1903; work commenced May 13, 1904; contract expires Aug. 4, 1904.
Albert Kirchner, Fountain City, Wis.	Building dams and shore protections, Burlington to Hannibal.	Rock, $1.39; brush, 58 cents.	Approved July 31, 1903; work commenced Oct. 12, 1903; contract expires July 31, 1904.
M. A. Sweeney Shipyard and Foundry Co., Jeffersonville, Ind.	Building wooden hulled steam towboat at Jeffersonville, Ind.	Price, $16,000	Approved Apr. 15, 1904; work commenced May 30, 1904; contract expires Oct. 15, 1904.

Comparative cost of material, 1903.

[Per cubic yard.]

Locality.	Rock.		Brush.	
	In place.	On United States barges.	In place.	On United States barges.
Reeds to Winona				$0.175
Alma		$0.70		
Chimney Rock		.695		
Fountain City		.68		
Minneiska to Winona		.74		
Winona to Genoa				.177
Do				.19
Do				.16
Trempealeau to Dakota				.16
Root River				.19
Britts Landing				.19
Wisconsin River to Bellevue				.18
Cassville to Dubuque				.1675
Cassville		.595		
North Buena Vista		.60		
Waupeton		.58		
Spechts Ferry		.55		
Eagle Point to Dubuque		.58		

Comparative cost of material, 1903—Continued.

[Per cubic yard.]

Locality.	Rock.		Brush.	
	In place.	On United States barges.	In place.	On United States barges.
Eagle Point to Bellevue		$0.62		
Dubuque to Bellevue		.62		
Do				$0.1725
Bellevue to Le Claire	$1.39		$0.56	
Rock Island to Burlington	.97		.28	
Do	1.46		.58	
Burlington to Hannibal	.98		.29	
Do	1.39		.58	
Dallas City				.25
Nauvoo		.49		
Keokuk		.60		
Quincy to Clarksville				.22
Hannibal to Clarksville				.19
Hannibal		.65		
Clarksville to Hamburg				.21
Stag Island				.175
Dardenne Island				.19
Westpoint Landing		.65		
Busch				.20
Denmark Island				.17

NOTE.—The price per cubic yard of rock delivered on barges varied from 49 cents at Nauvoo to 74 cents Minneiska to Winona. The average cost of rock during the season was 64 cents.

The price per cubic yard of brush varied from 16 cents near Genoa to 25 cents at Dallas City. The average cost of brush during the season was 18 cents.

United States improvement, upper Mississippi River, St. Paul to Missouri River (*Rock Island Rapids not included*), *1878–1903.*

[Including some desultory work done prior to 1878.]

Total length of dams (1,187,651 feet)	miles	224.9
Total length of shore protections (968,193 feet)	do	183.3
Dams:		
Total rock	cubic yards	3,509,860.2
Total brush	do	5,056,746.3
Total material	do	8,566,606.5
Average per linear foot, rock	do	2.96
Average per linear foot, brush	do	4.26
Average per linear foot, material	do	7.22
Shore protections:		
Total rock	do	1,673,949.6
Total brush	do	1,497,712.5
Total material	do	3,171,662.1
Average per linear foot, rock	do	1.73
Average per linear foot, brush	do	1.55
Average per linear foot, material	do	3.28
Grand total of material used	do	11,736,268.6

Fuel statement, floating plant, season of 1903.

District.	Coal (tons).	Average cost per ton.	Total cost.	Tow, mileage, and average cost for fuel.				Name of boat.	Hours per day.
				Days.	Per day.	Miles.	Per mile.		
St. Paul tc Winona	785	$4.65	$3,648.89	58	$19.24	3,129	$0.36	Fury	24
				85	12.74	3,007	.36	Fury	12
				122	6.60	3,683	.22	Emily	12
				55	11.72	......	......	Vulcan[a]	8
Winona to Wisconsin River.	682	3.68	2,513.19	116	14.00	6,691	.24	Alert	12
				142	6.26	5,138	.17	Elsie	12
Wisconsin River to Bellevue.	1,881	3.11	5,852.56	4	13.88	256	.22	Coal Bluff	12
				155	18.11	8,547	.33	Vixen	24
				174	2.13	2,308	.16	Louise	12
				85	29.54	......	......	Dredge 203	16
				4	2.06	......	......	Pile driver 104	......
Rock Island Rapids, Illinois and Mississippi Canal, surveys, etc.	1,351	2.53	3,415.19	183	3.43	6,633	.09	Ruth	12
				200	3.49	10,517	.07	Mac	12
				36	3.31	551	.22	Emily	12
				23	1.15	130	.20	Stella	12
				182	4.27	......	......	Drill boat 6	16
				105	4.48	......	......	Drill boat 103	16
				208	2.03	......	......	Ajax[a]	8
				40	2.54	......	......	Vulcan[a]	8
				4	1.53	......	......	Pile driver 104	8
Des Moines Rapids Canal and bar at Quincy.	1,038	2.31	2,401.53	185	10.64	......	......	Phoenix and Lucia[a]	16
				11	20.68	......	......	Dredge 203 and Stella.[b]	......
Hannibal to Missouri River.	924	2.04	[c]1,974.23	114	16.17	5,608	.33	Coal Bluff	14
Snag boat	1,356	2.68	3,643.94	210	17.35	7,596	.48	Mackenzie	12
Total	8,017	2.925	23,449.53	......	......	......	......	......	......

[a] Dipper dredge. [b] Pump dredge. [c] Including 48½ cords wood.

Subsistence statement, season of 1903.

District.	Number days subsisted.	Cost.		Average per day.	
		Without cooks.	With cooks.	Without cooks.	With cooks.
St. Paul to Winona, including North Pepin pier and dredging at Stockholm	11,486	$4,518.21	$5,865.56	$0.393	$0.510
Winona to Wisconsin River	19,797	6,357.96	7,904.77	.321	.399
Wisconsin River to Bellevue, including dredging in Guttenberg channel	10,411	2,978.49	3,843.81	.286	.369
Rock Island Rapids, including Illinois and Mississippi Canal, examinations and surveys, etc.	13,234	3,661.13	5,201.79	.277	.393
Des Moines Rapids Canal, Burlington to Hannibal, Warsaw to Quincy levee, bar at Quincy, and surveys	6,182	1,684.42	2,440.40	.272	.394
Hannibal to Missouri River, and channel and harbor at Hannibal	6,858	1,912.46	2,471.29	.279	.360
Snag boat	5,586	2,254.08	2,943.75	.404	.527
Total	73,554	23,366.75	30,671.37	.318	.417

Notes on dredging sand and earth (continued from Annual Report of 1900).

Year.	Locality.	Cubic yards.	Cost per cubic yard.	Method.
1900	St. Paul Stock Yards	47,000	$0.82	Hired labor, United States hydraulic dredge.
	East Dubuque	18,314	.117	Hired labor, United States dipper dredge.
	Clinton	105,133	.063	Hired labor, United States hydraulic dredge.
	Fulton	1,209	.243	Hired labor, United States dipper dredge.
	Quincy Harbor	78,684	.098	Do.
	Des Moines Rapids Canal	102,208	.087	Do.
	Illinois and Mississippi Canal	1,759	.30	Do.
1901	Dubuque	11,600	.03	Hired labor, United States hydraulic dredge.
	Burlington Harbor	6,169	.08	Hired labor, United States dipper dredge.
	Dubuque	19,725	.073	Hired labor, United States hydraulic dredge.
	Des Moines Rapids Canal	151,786	.106	Hired labor, United States dipper dredge.

Notes on dredging sand and earth (*continued from Annual Report of 1900*)—Continued.

Year.	Locality.	Cubic yards.	Cost per cubic yard.	Method.
1901	Galena River	46,795	$0.131	Hired labor, United States hydraulic dredge.
	Illinois and Mississippi Canal	12,186	.081	Hired labor, United States dipper dredge.
1902	Fulton	3,614	.12	Do.
	Hamburg	13,136	.096	Do.
	Burlington	10,848	.10	Do.
	Fountain City Bay	3,076	.24	Do.
	Des Moines Rapids Canal	107,221	.092	Do.
	Illinois and Mississippi Canal	10,208	.108	Do.
1903	Fountain City	13,594	.15	Do.
	Guttenberg channel	191,194	.057	Hired labor, United States hydraulic dredge.
	Hannibal	5,542	.15	Contract, dipper dredge.
	Des Moines Rapids Canal	69,225	.179	Hired labor, United States dipper dredge.
	Illinois and Mississippi Canal	25,500	.137	Do.
	Whitneys bar	22,665	.14	Do.
	Warsaw-Quincy levee	8,221	.098	Do.

Notes on rock excavation (*continued from Annual Report of 1900*).

Year.	Locality.	Removed from channel (solid cu. yds.)	Cost per solid cubic yard.	Method.
1900	Rock Island Rapids	3,631	$3.30	Hired labor, steam drill boat, dredge, dynamite.
1901	Fort Madison	1,735	2.40	Do.
1902	Rock Island Rapids	6,201	2.69	Do.
1903	do	6,425	3.65	Do.

Table showing dates of opening and closing of navigation of the Mississippi River at Rock Island, Ill., for thirty-two years.

Year.	Navigation opened.	Navigation closed.	Ice went out.	River closed by ice.
1871		Nov. 15		Dec. 1
1872	Apr. 1	do	Mar. 29	Nov. 29
1873	Mar. 18	Nov. 30	Mar. 15	Dec. 3
1874	Mar. 12	do	Mar. 10	[a]Jan. 6
1875	Mar. 31	Nov. 25	Mar. 29	Nov. 30
1876	Mar. 1	Nov. 30	Feb. 16	Dec. 2
1877	Mar. 25	do	Mar. 21	(b)
1878	Mar. 1	do	(c)	Dec. 19
1879	Mar. 10	Dec. 14	Mar 7	Do.
1880	Mar. 6	Nov. 18	Jan. 7	Nov. 22
1881	Apr. 15	Dec. 30	Apr. 14	(b)
1882	Mar. 10	Nov. 22	(c)	Dec. 11
1883	Mar. 27	Dec. 2	Mar. 18	Dec. 19
1884	Mar. 24	Nov. 22	Mar. 23	Dec. 18
1885	Mar. 31	Dec. 5	Mar. 30	Dec. 8
1886	Mar. 22	Nov. 24	Mar. 19	Dec. 2
1887	Mar. 14	Nov. 30	Mar. 10	Dec. 21
1888	Mar. 28	[d]Jan. 9	Mar. 19	[d]Jan. 10
1889	Mar. 13	Dec. 2	Mar. 12	[e]Jan. 16
1890	Mar. 22	Dec. 4	Mar. 19	[f]Feb. 4
1891	Mar. 25	Dec. 1	Mar. 10	Nov. 29
1892	Mar. 22	do	Feb. 13	Dec. 22
1893	Mar. 20	Nov. 23	Mar. 13	Dec. 2
1894	Mar. 15	Nov. 26	Mar. 4	Dec. 28
1895	Mar. 25	Nov. 21	Mar. 1	Dec. 6
1896	Mar. 27	Dec. 2	Feb. 25	[g]Jan. 26
1897	Mar. 24	Dec. 4	Feb. 11	Dec. 19
1898	Mar. 17	Dec. 3	Mar. 8	Dec. 8
1899	Mar. 16	Dec. 14	Mar. 13	Dec. 27
1900	Mar. 31	Dec. 13	Mar. 23	[h]Jan. 29
1901	Mar. 25	Dec. 16	Mar. 17	Dec. 14
1902	Mar. 10	Dec. 10	Mar. 5	[i]Jan. 8
1903	Mar. 16	Dec. 9	Mar. 7	Dec. 16
Average	Mar. 20	Dec. 2	Mar. 10	Dec. 23

[a] 1875. [b] Remained open. [c] Open all winter. [d] 1889. [e] 1890. [f] 1891. [g] 1897. [h] 1901. [i] 1902.

REPORT OF MR. J. D. DUSHANE, ASSISTANT ENGINEER.

United States Engineer Office,
St. Paul, Minn., February 17, 1904.

Major: I have the honor to submit the following report of operations for improving the Mississippi River between St. Paul and Winona, the district in my local charge for the calendar year 1903:

DREDGING.

Stockholm Harbor (*mile 68*).—The pier forming the harbor of refuge at Stockholm, Wis., was built in 1885. Since that time a gradual shoaling of the harbor on the upper side has resulted from the deposit of sand and mud carried into the lake by the storm water from a ravine. On the lower side the shoaling was caused by sand from the lake bottom being rolled shoreward. At very low stages the area for anchorage on the upper side was greatly reduced, and boats could not reach the shore or the pier except near the outer end. For deepening the harbor $2,500 was allotted from the appropriation for the general improvement. Work was begun April 28, the dredge *Vulcan* and dump boats 11 and 12 being towed from Fountain City by towboats *Fury* and *Emily.* The material from the upper side of the pier was a mixture of sand and mud and was wasted in deep water of the lake. The material from the lower side was sand with a small percentage of gravel and mud, and was practically all used in construction of the pier at Pepin, Wis. Above the pier an area of 13,300 square yards was dredged to 4 feet below low water, 8,374 cubic yards of material being removed. Below the pier an area of 5,700 square yards was dredged to 4 feet below low water, 5,553.4 cubic yards of material being removed. Dredging at Stockholm was discontinued June 19, the allotment being exhausted.

Dredging at United States boat yard (*mile 108*).—In July the dredging plant worked six days at the upper end of the United States boat yard at Fountain City, removing a fill in front of the yard caused by recent rains. The material, 1,896.5 cubic yards of rock, gravel, and sand, was deposited at outer ends of dams in the vicinity.

Dredging at Island 62 (*mile 109*).—The old shore protection at head of Island 62, built in 1887, behind which the bank had been washed away 75 to 100 feet, was dredged out to 6 feet below low water, the material, 706 cubic yards, being deposited under Dam 66 (sheet 17 [a]).

Upon completion of this work, July 15, the *Vulcan* and dump boats *11* and *12* were transferred to Mr. W. A. Thompson, assistant engineer.

REMOVING BAR AT MOUTH OF FOUNTAIN CITY BAY (MILE 109).

Under special allotment of $1,500 from appropriation of June 13, 1902, for "removing the bar in the Mississippi River at the mouth of Fountain City Bay, at foot of North street, Fountain City, Wis.," the work, which was begun November 1, 1902, was resumed June 22, 1903, by dredge *Vulcan*, dumps *11* and *12*, and towboat *Emily.* The bar was dredged to 12 feet below low water of 1864, and the material, 7,914.8 cubic yards of rock, gravel, and sand, was deposited between and at the outer ends of dams in the vicinity. The work was completed July 2, 1903. The total material removed from this bar is 10,990.9 cubic yards.

The total cost of the above work, including the dredging of 1902 at Fountain City bar and a plant charge of $513.12, was $2,013.12.

HARBOR OF REFUGE AT PEPIN, WIS. (MILE 74).

Under a special allotment of $14,000 from appropriation of June 13, 1902, "for the construction of a harbor of refuge on the east shore of Lake Pepin," work on the pier was resumed April 30, 1903.

The work was performed by hired labor and use of Government plant. Rock was furnished under emergency contract, at 60 cents per cubic yard, delivered on United States barges. Some rock was also furnished by hired labor, being taken from the shore of Lake Pepin, at a cost of 37.6 cents per cubic yard loaded on barges.

Work was carried on in a manner similar to that of last season, most of the material for the core, however, being brought from Stockholm Harbor, where dredging was in progress, instead of being dredged in the vicinity of the pier. During the season the pier was extended 252 feet, the riprap covering of this portion being only roughly thrown on, owing to the high stage of water prevailing at time of work. As a protection against storms and ice, the portion of the pier built this year should be graded and the rock laid in position at some low stage of water.

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[a] Sheet numbers are those of general maps, survey 1878–79.

There were put in this work during the season 5,995 cubic yards of sand and gravel and 2,205.3 cubic yards of riprap rock. The cost, including $748.71 plant charge, was $5,326.93. Work was discontinued June 9, the allotment being exhausted.

The total materials in the pier are as follows: Sand and gravel, 15,065 cubic yards; riprap rock, 5,333.3 cubic yards. The total length of pier is 705 feet; height, 12 feet above low water of 1864; slopes are 1 vertical to 2 horizontal. The total cost of this pier to date, including $2,319.63 plant charge, is $16,319.63.

BUILDING DAMS AND SHORE PROTECTIONS.

The work of building dams and shore protections was resumed under project approved March 3, 1903, by hired labor and use of Government plant, towboats *Fury* and *Emily* doing the towing. Materials were purchased under emergency contracts, at the following prices per cubic yard, delivered on United States barges: Riprap rock, 68, 69½, 70, and 74 cents; brush 17.8 cents, and rock, by hired labor from the shore of Lake Pepin, at a cost of 60 cents.

Vicinity of Wabasha (miles 81 and 82).—Operations were begun in vicinity of Wabasha June 17, at the crossing at the lower end of town. This crossing was one of the worst in this division during the season of 1902, when boats had trouble in getting over it. As a means of improving the crossing, four new dams were built and old dams in the vicinity were raised and extended, as follows: Sheet 14, Dam 1, built in 1878 to grade of low water of 1864, was extended 200 feet and raised to 4 feet above low water; Dam 2, built in 1878 to grade of low water, was raised to 4 feet above low water; Dam 19 was raised to 5 feet above low water, and the shore protection of the dam repaired; Dam 26 was raised to 4 feet above low water for a distance of 500 feet, beginning at shore; Dam 60 was built from the right bank, above Dam 1; Dam 61 was built from the right bank, between Dams 1 and 2; Dam 62, an ell, was built from Dam 2; Dam 63 was built from the left bank, between Dams 27 and 26. The shore protection opposite Crats Island was repaired and carried to top of bank over a distance of 3,500 feet, beginning at upper end; the upper part of the bank had washed away 30 to 60 feet back of the old shore protection.

Above Fountain City (miles 107 and 108).—Upon completion of the above work—September 10—the fleet was moved to above Fountain City, where operations were continued. From Dam 47 to Dam 39 (sheet 17) the river has been bad for the past five years, at times there being five crossings within this distance, notwithstanding that the dams, practically all built and full length, have been operating all this time. This year was the first in that time that the channel has been in a position favorable to further work. In order to better the direction of the channel and to give a more permanent course through this stretch, the channel limits were reduced to 700 feet. Old dams were extended and repaired and new dams built, as follows: Sheet 17—Dams 6, 7, 19, 23, 26, 41, 47, 48, 49, and 50 were raised to 4 feet above low water of 1864; Dams 42, 44, and 45 were extended 350, 180, and 80 feet, respectively; Dam 67 was built from the bar between Dams 42 and 44; Dams 68 and 69 were built from Island 58; Dam 70 was built from Island 59. Owing to high water, the work was greatly delayed and only a part of that proposed for this locality was accomplished. The high water also compelled the suspension of brush cutting and seriously interfered with loading of rock. The cost of the work was greatly increased.

Operations for the season were discontinued October 27, and the fleet put in winter quarters in Fountain City Bay.

Further details are given in the following list of works and financial statements:

List of works constructed and repaired, and of materials used during the season of 1903 between St. Paul and Winona.

Designation.	Length.	Height above low water, 1864.	Rock.	Brush.
Sheet 14 (miles (81-82):	*Feet.*	*Feet.*	*Cubic yds.*	*Cubic yds.*
Dam 1, raised	....	4	272.1	....
Dam 1, extended	200	4	739.6	1,279.8
Dam 2, raised	....	4	1,299.1	98.0
Dam 19, repaired	....	5	817.3	105.0
Dam 26, repaired, part only	....	4	472.1	....
Dam 60	275	4	846.0	1,492.3
Dam 61	900	4	1,677.3	3,309.5
Dam 62	995	4	730.8	1,314.1

List of works constructed and repaired, and of materials used during the season of 1903 between St. Paul and Winona—Continued.

Description.	Length.	Height above low water, 1864.	Rock.	Brush.
	Feet.	*Feet.*	*Cubic yds.*	*Cubic yds.*
Dam 63	815	4	1,903.2	4,146.3
Shore protection opposite Crats Island, repaired	....	8-10	5,086.1	3,774.1
Sheet 17 (miles 107-108):				
Dam 6, repaired	....	4	203.5	....
Dam 7, repaired	....	4	261.5	....
Dam 19, repaired	....	4	451.3	....
Dam 23, repaired	....	4	160.7	....
Dam 26, repaired	....	4	513.5	....
Dam 41, repaired	....	4	325.9	109.0
Dam 42, extended	350	4	666.0	1,464.4
Dam 44, extended	180	4	358.8	1,121.9
Dam 45, extended	80	4	422.3	1,036.7
Dam 47, repaired	....	4	357.8	....
Dam 48, repaired	....	4	203.0	....
Dam 49, repaired	....	4	37.0	....
Dam 50, repaired	....	4	181.4	....
Dam 67	240	4	448.8	837.1
Dam 68	200	4	502.9	1,256.3
Dam 69	125	4	411.1	1,144.2
Dam 70, not finished	185	1	889.9	2,583.2
Total	....	....	20,239.0	25,071.9

Financial statement for work of building dams and shore protections between St. Paul and Winona for the calendar year 1903.

Amount expended in the field		$39,389.80
Add for general superintendence and office expenses		1,772.33
Add for use and deterioration of plant		3,396.82
Total		44,558.95
Material put in place:		
Rock	cubic yards	20,239.0
Brush	do	25,071.9
Total	do	45,310.9
Average cost per cubic yard:		
On barges		$0.403
For towing		.192
For putting in place		.228
For local superintendence while not in field		.046
For general superintendence and office expenses		.039
For plant		.075
Average cost per cubic yard in place		.983

IN GENERAL.

The contractors for rock being unable to furnish the desired quantity as required, owing to rains and scarcity of labor, a small crew was put at work getting out and loading rock by hired labor from the shore of Lake Pepin, above Frontenac. In this way 3,063.7 cubic yards of rock were secured at an average cost of 55.4 cents per cubic yard, 630.1 cubic yards of which were used in Pepin pier and 2,433.6 cubic yards in dams and shore protections in the vicinity of Wabasha.

At the beginning of the season quite extensive repairs were made to the machinery of dredge *Vulcan*. New swinging and backing chains were put in; a new feed-water heater was installed; a new dipper (made at United States machine shop at Keokuk), was put on, and the machinery was thoroughly overhauled. The pockets of dump boats 11 and 12 were rebuilt.

Eleven new barges are being built at St. Paul—5 for this district and 6 for the district Hannibal to Missouri River. The work of construction is being done under emergency contract with George Hagen and was begun October 1, 1903, all materials being furnished by the Government. The barges are being built of Washington fir.

In July, after the river had fallen sufficiently, 21 buoys were placed to mark the ends of dams near the channel.

The season was extraordinary on account of the excess of rain and high water during the latter part of the year. There was no low water throughout the season of navigation. During July, August, September, and October 23.76 inches of rain fell at St. Paul, the excess for these four months being 12.23 inches, showing more than double the average rainfall. There was also an excess of rain for each of the three months of spring.

Respectfully submitted.

J. D. DuShane,
Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

REPORT OF MR. W. A. THOMPSON, ASSISTANT ENGINEER.

United States Engineer Office,
La Crosse, Wis., January 20, 1904.

Major: I have the honor to submit the following report of operations for improving the Mississippi River in the district in my local charge for the calendar year ending December 31, 1903:

WINONA TO WISCONSIN RIVER.

The improvement of this portion of the river, by the construction of rock and brush dams and shore protections, was carried on by hired labor and use of Government plant, towboats *Alert* and *Elsie* doing the towing. The rock used was lime rock, quarried and loaded on United States barges by hired labor and use of Government plant. The brush was purchased in open market, under emergency contracts, at 16, 17.7, and 19 cents per cubic yard, on United States barges.

Necessary repairs having been made, the greater part of the fleet was placed in commission on June 17 and the remainder on July 6. Regular construction work was commenced on June 17. The high stage of water that prevailed throughout the greater part of the working season, and which flooded the low ground and islands where most of the brush is cut, rendered it extremely difficult to obtain brush. This scarcity of brush restricted the amount of work that could be done, and the high water made construction operations more difficult. A scarcity of efficient labor was felt, particularly at the Government quarry at Lamoille, which was operated only eight hours a day, whereas for economical working, were labor plentiful, it should be run at least sixteen hours a day.

During the season from June 17 to November 7 improvements and repairs were made in the vicinity of Lamoille, Dresbach Island, and below and opposite La Crosse.

Lamoille bar.—In 1894 the bar above Lamoille caused much trouble to navigators. A number of wing dams were constructed during the summer of that year to afford temporary relief. The location of some of these dams was not in accordance with the project for permanent improvement. Since then there has been more or less trouble at this place on account of the channel being crooked and difficult for steamboats and rafts to follow during low stages. It was decided this year to complete, as far as possible, the improvement according to the original project. This necessitated the removal of parts of Wing Dams 21 (mile 124), 22, 23, 24, and 26 (mile 125), a total of 2,055 linear feet of dams removed. Wing Dams 29, 30, 31, and 33—all in mile 125—were repaired and extended 150, 535, 395, and 315 feet, respectively. Closing Dam 2 (mile 125) was repaired and raised. Work of protecting cutting bank on Wisconsin side above Closing Dam 2 (mile 125) was commenced, but on account of the very high stage of water in September was not completed. The work at Lamoille bar should be finished next season.

Vicinity of Dresbach Island.—Work of permanent improvement in this part of the river was commenced in 1902. During this season Wing Dams 52 and 53 (mile 137), begun in 1902, were completed. In mile 137 Wing Dams 57 and 59 were built; total length, 1,265 feet. In mile 138 Wing Dams 55, 58, 60, 61, 62, 63, 64, and 68 were built; total length, 6,235 feet. Closing Dam 71, 800 feet long, across Dresbach Slough, was built. Wing Dams 56 and 70 were commenced but not completed. In mile 139 Wing Dams 65, 67, and 69 were built; total length, 1,768 feet. Closing Dam 66, 750 feet long, from Dresbach Island to Island 97, was built. Work of protecting left bank, commencing 300 feet below Wing Dam 52 (mile 137), begun late in 1902, was continued; total length, 2,600 feet. Owing to high stage of water, this protection was not completed. The protection of the shore on east side of Dresbach Island, beginning at Wing Dam 63 (mile 138), and extending downstream 1,550 feet, was commenced, but, on account of high water, was not completed. Shore protection, 1,500 feet long, on left bank, beginning 235 feet below Wing Dam 33 (mile 139), was commenced but not completed. Old Wing Dam 3 (sheet 20, mile 138) was removed; this was a temporary dam, built in 1889.

Below and opposite La Crosse.—Old Closing Dam 41 (sheet 22, mile 148), across Sand Slough, was raised to 7 feet above low water and the top made 20 feet wide. Old Closing Dam 59 (mile 147) was repaired and raised to 4 feet above low water. Slight repairs were made to shore protection on east side of Barrons Island, opposite La Crosse (mile 145).

Operations were suspended November 7 and the fleet placed in winter quarters in Fountain City Bay and Black River, at La Crosse.

Further details as to length, height, and amounts of material used in each dam and shore protection are given in the following table:

List of works constructed and repaired, and of materials used, during the season of 1903, Winona to Wisconsin River.

Designation.	Length.	Height above low water, 1864.	Rock.	Brush.
Sheet 19 (mile 125):	*Feet.*	*Feet.*	*Cubic yards.*	*Cubic yards.*
Closing Dam 2 repaired		4	722.4	1,172.6
Wing Dam 29 repaired		4	901.3	1,902.8
Wing Dam 29 extended	150	4	300.0	600.0
Wing Dam 30 repaired		4	300.1	655.4
Wing Dam 30 extended	535	4	334.0	1,352.0
Wing Dam 31 repaired		4	404.2	1,478.5
Wing Dam 31 extended	395	4	912.7	2,687.3
Wing Dam 32 repaired		4	211.0	288.9
Wing Dam 32 extended	300	4	781.4	2,609.8
Shore protection opposite Island 78 not completed	300	8	206.3	367.3
Sheet 20 (miles 137–139):				
Wing Dam 52 completed		4	100.3	
Wing Dam 53 completed		4	696.9	
Wing Dam 57	700	4	996.9	2,226.8
Wing Dam 59	565	4	380.2	783.0
Shore protection, left bank, below Dam 52	1,900	11	3,399.0	3,518.6
Wing Dam 56 not completed	250	4	851.7	851.3
Wing Dam 58	1,040	4	1,460.1	1,443.3
Wing Dam 55	810	4	1,346.4	2,257.2
Wing Dam 60	750	4	881.2	1,586.9
Wing Dam 61	935	4	1,093.1	1,984.8
Wing Dam 62	680	4	943.0	1,889.9
Wing Dam 63	250	4	1,431.8	3,937.4
Wing Dam 64	910	4	416.4	586.2
Wing Dam 68	860	4	429.3	1,035.7
Wing Dam 70 not completed	250	4	217.4	197.2
Closing Dam 71	800	4½	1,751.4	3,429.1
Shore protection, Dresbach Island, below Dam 63	1,550	10	1,959.1	2,886.7
Wing Dam 65	888	4	613.9	1,016.9
Closing Dam 66	750	4	301.8	423.3
Wing Dam 67	350	4	209.9	633.4
Wing Dam 69	530	4	307.7	692.3
Shore protection, left bank, below Dam 33	1,500	11	2,381.0	4,321.4
Sheet 21 (mile 144):				
Shore protection, Barrons Island, repaired			100.5	
Sheet 22 (miles 147–148):				
Closing Dam 59 repaired			201.3	246.8
Closing Dam 41 repaired and widened on top		7	1,329.8	3,459.3
Total			28,873.5	52,522.1

Financial statement for work between Winona and Wisconsin River, performed by hired labor during season of 1903.

Amount expended in field during calendar year 1903 (from distribution sheets)		$51,788.45
Add quota of general superintendence and office expenses		2,201.03
Add for use and deterioration of plant, quarry	$1,497.46	
Add for use and deterioration of plant, building dams, etc	5,291.29	
		6,788.75
Total		60,778.23

Materials put in works:		
Rock	cubic yards	28,873.5
Brush	do	52,522.1
Total		81,395.6

Average cost per cubic yard:	
On barges	$0.319
For towing	.102
For putting in place	.194
For general superintendence and office expenses	.027
For local office expenses	.022
For plant	.083
Average cost per cubic yard in place	.747

Quarrying rock at Lamoille (mile 125).—Work was performed by hired labor and use of Government plant, the cable hoist being employed in transporting rock from quarry on top of bluff, 500 feet above water surface, to barges. Rand and Ingersoll-Sargeant steam drills were used for drilling. Before commencing work the cast-iron gearing was changed to cast steel, which was found to be a decided improvement. Operations were commenced May 13, 1903, with a single crew, working eight hours per day, and continued until November 4, the close of the season.

Financial statement for work of quarrying rock at Lamoille, Minn., performed by hired labor during season of 1903.

Amount expended during calendar year 1903 (from distribution sheets)	$16,201.84
Add quota of general superintendence and office expenses	688.58
Add for use and deterioration of plant	1,497.46
Total	18,387.88
Total number cubic yards rock quarried and loaded on United States barges during the season of 1903	28,873.5

Average cost per cubic yard:	
On barges	$0.561
For general superintendence and office expenses	.024
For plant	.052
Average cost per cubic yard on barges	.637

PLANT REPAIRS AT FOUNTAIN CITY.

Plant repairs were carried on by hired labor and use of Government plant at Fountain City boat yard from February 23 to December 31, 1903. During this period repairs to the plant belonging to the district St. Paul to Winona were made, in addition to the repairs made to the plant used in this district. During the season repairs were made to United States towboats *Alert*, *Fury*, *Elsie*, and *Emily;* 3 quarter boats, 2 building boats, 1 grasshopper, 18 barges, dredge *Vulcan*, and 2 dump boats. The construction of a new hull for towboat *Ada* was commenced but not completed.

Mr. J. F. McDonough, clerk, and Mr. H. T. Eastman, inspector, deserve credit for the able and efficient manner in which they have assisted me in this work.

Very respectfully, your obedient servant,

W. A. Thompson,
Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

REPORT OF MR. S. EDWARDS, ASSISTANT ENGINEER.

United States Engineer Office,
Rock Island, Ill., January 13, 1904.

Major: I have the honor to submit the following report of operations for improving the Mississippi River between the Wisconsin River and Bellevue, the district in my local charge, for the calendar year ending December 31, 1903:

REPAIRS TO PLANT.

Repairs to fleet in Dubuque Harbor were commenced February 1 and completed May 2, 1903. Extensive repairs were made to hydraulic dredge *No. 203*, and slight repairs to towboat *Coal Bluff*, office boat *No. 69*, quarter boat *No. 118*, barges *Nos. 99* and *176*, and to grasshoppers *Nos. 112* and *113*.

DREDGING IN GUTTENBERG CHANNEL.

Hydraulic dredge *No. 203*, tended by launch *Louise*, began operations May 19, 1903, and continued same to August 28, when she was sent to Keokuk. Operations consisted in removing outer portion of two bars in mile 231 (sheet 32) in proposed new channel. Considerable delays occurred, owing to the bar being greatly mixed with sawmill refuse. One bad breakdown also caused delay. The results, however, were satisfactory, especially after work of dam construction in this mile was begun, when the scour became rapid, and the outlook for a good channel at this point next season is favorable. This work straightens the most crooked part of Guttenberg channel. Estimated amount of sand removed by dredge and deposited outside of channel, 191,194 cubic yards.

The cost of this work, including superintendence and plant charges, was $10,894.57, or $0.057 per cubic yard.

September 19 to 24, dipper dredge *Vulcan*, tended by launch *Emily*, was employed in removing about 300 feet of outer end of Wing Dam 15 (sheet 33, mile 234), which interfered with raft navigation. It is proposed to remove the remainder of this dam next season. The dredge was received from snag boat *Col. A. Mackenzie*, and after completing work was towed to Le Claire.

BUILDING DAMS AND SHORE PROTECTIONS.

Construction work was carried on by hired labor and use of Government plant, towboat *Vixen* and launch *Louise* doing the towing. Material was purchased in open market, in accordance with existing regulations, and was furnished on United States barges at the following prices: Rock, 55, 58, 59½, 60, and 62 cents per cubic yard; brush, 16½, 16¾, 17¼, 18, and 19 cents per cubic yard. Operations were begun June 25, discontinued on account of high water July 18, resumed August 1, and closed for the season November 13, when the fleet was laid up in Dubuque Ice Harbor.

Work consisted of slight repairs to Ferry Dike (mile 289), opposite Bellevue, after which the fleet put in the remainder of the season between miles 223 and 234, Guttenberg channel. Owing to high water none of the work was completed. Nine wing dams were almost finished, 2 were barely begun, and Closing Dam 3 (sheet 32, mile 225) was repaired. The head of Island 187 was revetted, as was also the west bend in Island 188 (miles 225–226), and the island opposite Dams 7, 8, and 9 (sheet 32, mile 231).

The total length of dams built or begun during the season was 9,475 feet, and of shore protection 6,260 feet. The project for miles 224–225, above Glenhaven, was discontinued October 22, 1903, by your orders, after building Dam 10 and commencing Dam 11.

Further details are given in the following list of works and financial statement:

List of works constructed and repaired and of material used during season of 1903, Wisconsin River to Bellevue.

Designation.	Length.	Height above low water, 1864.	Rock.	Brush.
Sheet 32 (miles 224-231):	*Feet.*	*Feet.*	*Cubic yards.*	*Cubic yards.*
Wing Dam 11 (240 feet of apron only)	....	4	215.9	453.3
Wing Dam 10	2,200	....	4,859.8	8,118.0
Closing Dam 3, repaired	....	5	1,019.2	1,428.7
Shore protection, Island 187	1,420	....	1,561.5	2,689.4
Shore protection, Island 188	3,300	8-14	3,549.1	5,495.5
Wing Dam 13	780	4	825.7	988.6
Wing Dam 7	650	4	1,701.1	2,782.5
Wing Dam 8	1,090	4	2,516.1	3,824.5
Wing Dam 9	850	4	1,973.9	4,208.8
Wing Dam 12	1,280	4	1,488.0	2,585.1
Shore protection opposite Dams 7 and 8	1,540	7-10	1,662.3	3,360.1
Sheet 33 (mile 233):				
Wing Dam 21	590	4	590.0	1,582.0
Wing Dam 22	880	4	1,086.1	2,448.1
Wing Dam 23	740	4	780.0	2,264.5
Wing Dam 24	415	4	716.5	2,527.5
Sheet 39 (mile 289):				
Closing Dam 11 (ferry dike), repaired	....	6	480.8	....
Total	....	....	25,026.0	44,756.6

Financial statement for work of building dams and shore protections between Wisconsin River and Bellevue in 1903.

Amount expended in field during calendar year	$41,867.67
General superintendence and office	1,810.84
Plant charge	4,595.78
Total	48,274.29

Material put in works:		
Rock	cubic yards	25,026.0
Brush	do	44,756.6
Total	do	69,782.6

Average cost per cubic yard:	
On barges	$0.325
For towing	.101
For putting in place	.157
For local superintendence and office expenses	.017
For general superintendence and office expenses	.026
For plant	.066
Total	.692

DUBUQUE ICE HARBOR.

Owing to the lack of safe moorings for Government fleet and other craft piles were driven, November 16 to 18, as follows: Four clusters at southeast end of harbor (17 piles) and four clusters at north side of harbor (13 piles). The average length of the piles is 35 feet and the average elevation of their tops is 21 feet above low water. The piles are driven in from 12 to 16 feet and are held together in clusters with iron chains. The work is not completed.

Cost of above-mentioned work, $740.20.

IN GENERAL.

From the commencement to the close of the season work was greatly hindered by unusually high water as well as by several very severe rain storms. Brush was difficult to get in sufficient quantities and quarries were flooded several times. None of the works were actually completed, though they are in fair condition, in most instances only needing leveling off.

I would respectfully invite your attention to the good work done by Mr. Charles Ott, brush contractor, who continued to furnish brush until the close of the season and after all the other contractors had abandoned their work on account of high water. The brush, which was cut on top of the hills at a considerable extra expense to Mr. Ott, enabled me to do considerable work that I could not otherwise have done.

I was ably assisted throughout the season by Mr. E. F. Linderman, recorder, and Mr. Jos. B. Drechsler, timekeeper.

Very respectfully, your obedient servant,

S. Edwards,
Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

REPORT OF MR. J. C. M'ELHERNE, ASSISTANT ENGINEER.

United States Engineer Office,
Rock Island, Ill., February 19, 1904.

Major: I have the honor to submit the following report of operations for improvement of the Mississippi River in the district in my local charge for the calendar year ending December 31, 1903:

BELLEVUE TO LE CLAIRE.

Under project approved August 4, 1903, and allotment of $35,000, a contract, dated July 6, 1903, was entered into with Fetter & Crosby for the construction of dams and shore protections of rock and brush, at 56 cents per cubic yard for brush, and $1.39 per cubic yard for rock, in place.

No work was done during the season of 1903. The time for completion of the contract expires August 4, 1904.

IMPROVING ROCK ISLAND RAPIDS.

The section of river comprising the Rock Island Rapids extends from mile 348 to mile 364 below St. Paul.

The part of the fleet required for early service was repaired first, and the remainder as soon as practicable. The work of drilling, blasting, and dredging was commenced by drill boat *No. 6* on April 30, 1903, followed later by drill boat *No. 103*, and finally by dredge *Ajax*.

Dams.—Wing Dam 3 (sheet 47), abreast of Campbells chain, was repaired at shore end for a distance of 100 feet; width on top, 20 feet; height, 3½ feet above low water. Trailing Dam 8½, abreast of Winnebago chain, was raised and widened throughout, a distance of 850 feet, and was extended and given a width of 8 feet on top and a height of 4 feet at low water. Trailing Dam 9½, abreast of Duck Creek chain, was repaired on upstream half, a distance of 625 feet; it has now a width of 8 feet and a height of 3½ feet above low water. Wing Dam 15, abreast of Campbells chain, was repaired where broken, near shore, for a distance of 200 feet, to a width of 20 feet and a height of 3½ feet above low water. The material used was rock previously dredged from various channel points on the rapids.

Guide piers.—Such guide piers as had sustained injury from the action of ice gorges and floods were repaired and strengthened in their foundations. Nos. 1½, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 21, 22, and 24 received a considerable quantity of rip-rap rock, which was placed where most needed, principally around the upper ends and sides. The material for this purpose was supplied by dredge *Ajax*.

Rock excavation.—Two steam-drill boats, with double crews, were employed in blasting operations during the season. Drill boat *No. 6*, with double crew, beginning where work was stopped last fall, continued from April 30 to July 8, 1903, on the extensive upper right shoulder of Campbells chain; from July 9 to 21 it disrupted shoulders at Cabin and St. Louis chains, and a part of those at Crab Island chain. Hard limestone, with pockets of fire clay and gravel, was found in localities mentioned, and the depth of holes ranged from 3.2 to 7.1 feet. The area worked over at the first place was 32,739.4 square feet, and on the three latter localities 4,328.8 square feet. From July 22 to September 16 operations were carried on at upper left shoulder of Sycamore chain. The material met with was very hard limestone and a small quantity of gravel. A considerable amount of reblasting was necessary, owing mostly to fractured ledges caving in, especially at the bottom. The drilling ranged from 3.4

to 7.2 feet, and the area worked over was 24,374 square feet. From September 17 to 22 the drill boat blasted high lumps in Sucker Chute, covering an area of 2,649 square feet. On September 23 the boat was transferred to high rock patches on right side of Smiths chain, and operated there until October 28, on which date the boat was laid up and the crew disbanded. Hard limestone was encountered and some reblasting was necessary. The drilling ranged from 3.4 to 5.6 feet, and the area worked over was 13,590 square feet.

Drill boat *No. 103*, with double crew, on July 1, 1903, commenced blasting operations on right shoulder of Campbells chain, where work was left off at close of season of 1902, and continued thereon until July 23. From July 24 to September 17 work of disrupting obstructive upper left shoulder of Crab Island chain was carried on; the material met with was rock, hard in most places, but occasionally soft, shaley and lumpy, and covered with sand, gravel, and old coffer-dam material. A considerable amount of redrilling was found necessary, and the depth of holes ranged from 3.2 to 7.8 feet. The area worked over was 8,928 square feet at the former chain and 28,177 square feet at the latter one. From September 18 to 26 the drill boat worked at left shoulder of Lower chain and covered an area of 3,920 square feet; but, on the latter date, owing to a high stage of river, the boat was transferred to left shoulder of Sycamore chain, and continued operations there until October 13, when work by this boat was discontinued for the season. The limestone reef was quite hard, and loose rock caused some annoyance. The holes drilled ranged in depth from 3.3 to 7.8 feet, and the area worked over was 4,384 square feet.

Dredging rock.—Dredge *Ajax*, with a single crew, from May 11 to August 8, 1903, worked at removing the débris resulting from blasting in 1902, midway up large right shoulder of Campbells chain. From August 9 to August 24, the dredge took out débris from patch at Moline Crossing and from small shoulder of Cabin, St. Louis, and Crab Island chains. From August 25 to September 3, it operated on lower and upper shoulder of Sycamore chain, and from September 4 to October 20 removed débris from left shoulder of Crab Island chain. The material on this area was light and scattered. From October 21 to October 31, the dredge removed blasted material at Buoy No. 9, above Sycamore chain. From November 1 to 6, it removed broken rock from lower shoulder of Crab Island chain, and on November 7 commenced dredging in right shoulder of Campbells chain, continuing at that place until November 11, at which date operations were suspended on account of cold weather. All additional boats and barges belonging to the fleet were taken into Silver Lake Harbor on the approach of cold weather, and by November 13 were safely housed there for the winter. Those pieces needing extensive repairs were banked and some of them blocked up, while those requiring only minor repairs were left afloat.

The necessity of having to move the boats about considerably and work them on many small and occasionally light scattered rock shoulders and odds and ends of patches, and of having to contend at times with a higher summer stage of water than heretofore, made the work a little more costly than in recent years when continuous heavy excavation was met with throughout most of each season.

To J. B. Gordon, overseer, and John B. Corken, recorder, much credit is due for efficiency in the performance of their duties.

Details of operations, season of 1903.

Towboat *Ruth:*		
Hours in use under steam		1,423
Miles run, light		3,457
Miles run, towing		1,851
Miles run, total		5,308
Towboat *Mac*:		
Hours in use under steam		1,865
Miles run, light		2,645
Miles run, towing		2,693
Miles run, total		5,338
Drillboat *No. 6:*		
Hours worked		2,361
Hours lost owing to accidents, rafts, storms, etc		7
Holes drilled		3,198
Holes blasted		2,912
Linear feet of holes drilled		13,267
Ledge rock blasted	cubic yards	4,341
Pounds dynamite used		7,431
Range poles set in rock bottom		252
Ring bolts set		19
Water gauges set		6

Drillboat *No. 103:*		
Hours worked		1,376
Hours lost owing to accidents, rafts, storms, etc		14
Holes drilled		1,740
Holes blasted		1,606
Linear feet of holes drilled		7,299
Ledge rock blasted	cubic yards	2,508
Pounds dynamite used		5,028
Range poles set in rock bottom		116
Ring bolts set		10
Dredge *Ajax:*		
Hours worked		1,113
Hours lost owing to accidents		43
Cubic yards loose rock, fire clay, gravel, etc., dredged and removed		13,755

Summary of total amounts of material.

Ledge rock blasted and removed	cubic yards	6,424.8
Ledge rock blasted only	do	423.0
Ledge rock dredged and removed only	do	5,813.8
Loose rock, fire clay, gravel, etc., dredged and removed		13,755.0

Cost of rock excavation, including charges for use and deterioration of plant.

Designation.	Ledge rock excavated.	Total cost.	Average cost per cubic yard.
	Cubic yards.		
Shoulder head of Sucker Chute blasted and removed	880.0		
Shoulder Sycamore chain blasted and removed	640.0		
Shoulder of Crab Island chain blasted and removed	552.3		
Shoulder of St. Louis chain blasted and removed	110.0		
Shoulder of Cabin chain blasted and removed	192.5		
Shoulder of Campbells chain blasted and removed	4,050.0		
Total	6,424.8	$23,450.52	$3.65
Rock patches in Smiths chain blasted only	400.0		
Shoulder of Lower chain blasted only	23.0		
Total	423.0	1,184.40	2.80
Shoulder of Sycamore chain dredged only	424.1		
Shoulder of Campbells chain dredged only	5,076.1		
Shoulder at Moline crossing dredged only	313.6		
Total	5,813.8	5,232.42	.90
Grand total	12,661.6	29,867.34	

NOTE.—The material covered by the last three items in above table was blasted in 1902, at a cost of $15,621.68, or $2.687 per cubic yard, which, added to cost of dredging in 1903, $5,232.42, gives $20,854.10, or $3.58 per cubic yard for total removal of material in those three localities.

Cost of repairs to old piers, including charge for use and deterioration of plant.

Material.	Cubic yards.	Total cost.	Cost per cubic yard.
Riprap rock in place	8,550	$5,731.06	$0.6703

List of dams and of material used in their construction and repair during the season of 1903.

Designation.	Length.	Height above low water, 1864.	Riprap rock.		Total amount.
			New work.	Repairs.	
	Feet.	*Feet.*	*Cubic yards.*	*Cubic yards.*	*Cubic yards.*
Sheet 47:					
Wing Dam 3, repaired		3.5		275	275
Trailing Dam 8½, extended, repaired, and widened	300	4.0	1,285	1,530	2,815
Trailing Dam 9½, repaired		3.5		1,360	1,360
Wing Dam 15, repaired		3.5		755	755
Total			1,285	3,920	5,205

Cost of dams, including charge for use and deterioration of plant.

Material.	Cubic yards.	Total cost.	Cost.		
			Towing, per cubic yard.	Putting in, per cubic yard.	Total, per cubic yard.
Riprap rock in place	5,205	$3,489.43	$0.178	$0.4925	$0.6703

Financial statement for improvement of Rock Island Rapids for season of 1903.

Amount expended in the field	$32,251.12
Add quota of general superintendence and office expenses	1,370.67
Add for use and deterioration of plant	5,466.04
Total	39,087.83
Distributed as follows:	
Rock excavated and removed	23,450.52
Rock broken up, but not removed	1,184.40
Rock broken up in 1902, but dredged in 1903	5,232.42
Dams 3, 8½, 9½, and 15	3,489.43
Guide Piers 1½, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 21, 22, and 24	5,731.06
Total	39,087.83

SURVEYS, ETC.

Between August 27 and September 28, 1903, surveys of some of the most obstructive bars were made, viz: In the vicinity of Savanna, at Dark Slough, at crossing below Dark Slough, and below Pomme de Terre Prairie. Further work was suspended, owing to the advent of a high stage of water.

On August 5 and 6 the towboat *Ruth* set buoys on ends of dams for the guidance of navigators, as follows: At Bellevue, 4; at Clinton, 5, and at Camanche, 5. Total number set, 14.

BUOYS ON ROCK ISLAND RAPIDS.

The entire lot of buoys in storage was repaired and repainted, new anchor bolts and chains having been made and put on several of them. All of the buoys were reset by the towboat *Ruth* between June 18 and July 4, 1903. A few buoys, which had been torn from their fastenings by boats, were replaced. Toward the close of the season the buoy ranges were gone over, and between October 19 and 31 the buoys were taken up and safely stored with the fleet for the winter.

Total number of buoys in the system, 42; cost of buoyage for the season, $600.

Very respectfully, your obedient servant,

J. C. McElherne,
Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

REPORT OF MR. C. W. DURHAM, ASSISTANT ENGINEER.

United States Engineer Office,
Rock Island, Ill., January 6, 1904.

Major: I have the honor to submit the following report of operations for improvement of the Mississippi River between Rock Island (mile 363) and Burlington (mile 442), the district in my local charge, for the calendar year ending December 31, 1903.

ROCK ISLAND TO BURLINGTON.

1. Under project approved July 30, 1902, and allotment of $35,000 from appropriation of June 13, 1902, Contractor Albert Kirchner resumed operations April 14, 1903, under contract expiring September 20, 1903, and finished the contract on July 14, 1903. The prices paid under this contract were 97 cents per cubic yard for rock and 28 cents per cubic yard for brush. The work done during the season of 1903 was the construction of 2 wing dams from Island 361 (mile 423); of a closing dam from Island 362 to Johnsons Island (mile 424); of a trailing dam with wing dam (spur) from Island 376, opposite Burlington (miles 441–442), and repairs to the shore protection on Moores towhead (mile 441). This work and the work mentioned in paragraph 2 were in local charge of R. Munroe, junior engineer, whose duties were well performed.

List of works constructed and of materials used during the season of 1903, under contract with Albert Kirchner, between Rock Island and Burlington.

Designation.	Length.	Height above low water 1864.	Rock.	Brush.
Sheet 55 (mile 423):	*Feet.*	*Feet.*	*Cubic yards.*	*Cubic yards.*
Wing Dam 8	1,150	4	2,595.6	4,488.7
Wing Dam 9	1,000	4	2,697.8	5,133.8
Sheet 56 (mile 424):				
Closing Dam 7	400	4	732.4	1,053.8
Sheet 58 (miles 441–442):				
Trailing Dam 19	2,450	4	5,030.8	9,460.4
Wing Dam 20	450	4	1,154.1	1,987.8
Shore protection, Moores towhead, repaired		6	144.4	
Total			12,355.1	22,124.5

Financial statement for work performed (entire 1902 contract) between Rock Island and Burlington, under contract with Albert Kirchner.

Amount paid contractor		$31,443.35
Cost of local inspection, etc		1,188.01
Quota of general superintendence and office expenses		1,664.49
Add for use and deterioration of plant		48.08
Total		34,343.93
Material put in works:		
Rock	cubic yards	21,876.9
Brush	do	36,509.8
Total	do	58,386.7
Average cost per cubic yard in place		$0.588
Average cost per cubic yard for inspection		.020

2. Under project approved April 6, 1903, and allotment of $35,000 from appropriation of March 13, 1903, contractors Fetter & Crosby commenced operations on July 31, 1903, under contract expiring August 5, 1904, and closed for the winter on November 21, 1903, laying up their fleet at Cooks Point (mile 365). The prices paid under this contract were $1.46 per cubic yard for rock and 58 cents per cubic yard for brush. The work done during the season of 1903 was the raising and repairing of the closing dam between Credit Island and the Iowa shore (mile 365), the completing of 2 wing dams (built of gravel in 1902) from Illinois shore above Horse Island (mile 368), the constructing of 4 wing dams from Smith Island (miles 370 and 371), and 1 wing dam from Island 321 (mile 378).

List of works constructed and of materials used during the season of 1903, under contract with Fetter & Crosby, between Rock Island and Burlington.

Designation.	Length.	Height above low water 1864.	Rock.	Brush.
Sheet 48 (miles 365–368):	*Feet.*	*Feet.*	*Cubic yards.*	*Cubic yards.*
Closing Dam 1, raised (charged to "Ice Harbor below Davenport")	....	8	1,191.2	2,421.6
Closing Dam 1, repaired	....	....	1,778.8	2,087.4
Wing Dam 29	....	4	713.1	635.4
Wing Dam 30	....	4	1,324.9	1,710.4
Sheet 49 (miles 370–371):				
Wing Dam 11	600	4	1.759.5	3,185.1
Wing Dam 12	550	4	932.1	1,729.7
Wing Dam 13	475	4	914.5	1,494.7
Wing Dam 14	225	4	602.7	1,047.9
Sheet 50 (mile 378):				
Wing Dam 11	300	4	1,024.5	1,956.4
Total	....	....	10,241.3	16,268.6

Financial statement for work performed in 1903 between Rock Island and Burlington, under contract with Fetter & Crosby.

Amount paid contractor		$21,949.26
Retained percentage on contract		2,438.82
Cost of local inspection		1,093.34
Quota of general superintendence and office expenses		949.45
Add for use and deterioration of plant		21.35
Total		26,452.22
Material put in works:		
Rock	cubic yards	10,241.3
Brush	do	16,268.6
Total	do	26,509.9
Average cost per cubic yard in place		$0.964
Average cost per cubic yard for inspection		.041

FLINT CREEK TO IOWA RIVER LEVEE.

(*Miles 411–440 on the Upper Mississippi River.*)

During January and February, 1903, the shore protection on the right bank of the Iowa River, in sections 3, 4, and 5, which was built to a 5-foot stage in 1896 and 1897, was carried to the top of the bank by hired labor. In this work riprap rock only was used, which was delivered on the river bank where required at $1.25 per cubic yard. The shore protection was completed from station 157 to station 163, and from station 250 to station 263, a total length of 1,900 feet. In this work 542.3 cubic yards of rock was used, at a cost, including inspection, etc., of $1,144.71, or 60 cents per linear foot.

A flood occurred in June, 1903, which, in the Iowa River and at New Boston, was the highest on record, and at Keithsburg only 0.5 foot below the high water of 1892. On account of imminent danger to the levee, towboat *Ruth*, with 2 barges and a working outfit of sacks, wheelbarrows, and shovels, was sent from Rock Island to its relief on June 5. The *Ruth*, with a force of laborers in charge of Overseer J. B. Gordon, aided by the land owners and their men, did excellent service in averting breaks by the use of sand bags, brush, etc., at many points between section 3 and section 25. Contractor Kirchner, with towboat *Percy Swain* and laborers, worked for a short time at section 33. The *Ruth* remained until all danger was over, and then, having made an inspection of the entire levee, returned to Rock Island on the 15th. This inspection made it plain that there were 23 weak places, of varying extent, at any or all of which the levee would probably have broken had not prompt assistance been rendered. The cost of the relief work was $1,096.30. This levee, which was the only levee built entirely by the Government, was also the only levee, between Rock Island and St. Louis, to successfully withstand the above-mentioned flood.

An inspection of the levee made during the first week of December, 1903, shows that early work is desirable at section 5, where about 200 linear feet of new shore protection (Iowa River) is needed, and 300 feet of old protection should be carried to top of bank; at section 6, where about 2,000 feet of shore protection is needed, and 800 feet should be carried to top of bank. In section 10, at Dennison Slough, there should be a banquette. The levee bank needs strengthening for about 100 feet (station 608) in section 12; at Iowa Slough, in section 16; at Cox Lake, in section 18, and at Laswell Slough, in section 27. Some of the outflow valves in sections 27, 31, and 35 are broken.

Although some good might be done with the money now available (about $640), it is thought best to save it for emergencies, unless some suitable specific demand is made for its use.

HARBOR OF REFUGE BELOW DAVENPORT, IOWA.

The river and harbor act of June 13, 1902, provides that "the ten thousand dollars heretofore appropriated by the sundry civil act of March third, eighteen hundred and ninety-nine, for the improvement of the Mississippi River at Davenport, Iowa (mile 363), with the further sum of five thousand dollars to be taken from amounts appropriated in this paragraph, shall be applied for the construction of a harbor of refuge from ice at a point at or below the said city of Davenport and other necessary improvements of said harbor."

Several locations for the harbor were proposed and advocated by steamboatmen and others, and, after a protracted consideration of the various sites, the city of Davenport, on December 4, 1902, chose the location in the slough behind Credit Island (Rockingham Slough). The proper riparian concessions having been granted by the owners of all adjoining land, a survey of Rockingham Slough was made in August, 1903, and a project was presented September 22, 1903, which project was approved October 1, 1903. This project contemplates raising the closing dam at the head of the slough, the dredging of about 54,000 cubic yards of sand and gravel, the putting in of piling and cribs for mooring purposes, and the excavating of a small amount of rock.

Under contract with Fetter & Crosby, the closing dam was raised to a crest elevation of 8 feet above low water and thoroughly repaired. A part of the expense was charged to the general improvement appropriation. There were put in place, charged to the account of the harbor, 1,191.2 cubic yards rock and 2,421.6 cubic yards brush, at a cost, including inspection, of $3,256.18.

A few test piles were driven on the north side of the slough to ascertain the character of the bottom and the feasibility of using piles for moorings.

BUOYS.

Buoys were placed, as usual, to mark the location of the ends of certain dams that are dangerous to raft navigation at stages when the crest of the dam is covered with water to a depth of less than 3½ feet. The regular buoys in my district are 13 in number.

SURVEYS.

There were made during the season examinations of the river at foot of Muscatine Prairie (miles 397–398); at Muscatine (miles 390–391); at head of Hershey Chute (miles 383–384), and in the vicinity of Montpelier (miles 377–379). Other surveys were proposed, but the high water which prevailed during the entire season made them inexpedient.

IN GENERAL.

The localities most in need of improvement appear to be in the vicinity of Montpelier (mile 378), where an extension of the system of dams is required; at foot of Muscatine Prairie (mile 397); below Muscatine (miles 391–392), and at Johnsons Island (mile 424). The following-named work is also recommended, viz: The protection of the east bank of Turkey Island (mile 406) for about 3,000 linear feet; of the Illinois shore opposite Turkey Island and below, about 10,000 linear feet (miles 407–408); of the Illinois shore between New Boston and Keithsburg (mile 416), 3,000 feet, and of the Illinois shore in the vicinity of Johnsons Island (miles 422–424), about 10,000 feet. The protection of the Iowa shore below Port Louisa should be extended about 1,500 feet and the old work repaired (miles 404–405). A series of short wings from the Iowa shore above Fairport (mile 381) is desirable, to keep the channel away from the flat, rocky shore. The chute between islands 348 and 349 (mile 402) should be closed to prevent a too great diversion of the channel water, and the Iowa shore opposite protected.

Very respectfully, your obedient servant,

C. W. Durham,
Principal Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

REPORT OF MR. M. MEIGS, U. S. CIVIL ENGINEER.

United States Engineer Office,
Keokuk, Iowa, January 28, 1904.

Major: I have the honor to submit the following report of operations for improving the Mississippi River in the district in my local charge, extending from Burlington, Iowa (mile 442), to Hannibal, Mo. (mile 541), for the calendar year 1903.

The extreme high water of the whole season of 1903 was unusual, and, while aiding navigation, made river improvement difficult and at times impossible. The season opened April 1, 1903, with a stage at Keokuk of 9.85 feet above low water, and culminated in a flood only one-half tenth lower than the great high water of 1888 (19.65), making a record on June 5, 1903, at 8 p. m., of 19.60 feet. The flood below Keokuk was materially higher than that above the Des Moines rapids, owing to the combining of the flood out of the Des Moines River with that in the main river. Great destruction to the levees was wrought below Keokuk, and the extreme highest point attained at Alexandria was the highest since 1851, being 1 foot higher than the flood of 1888. At Canton, 17 miles below, this 1 foot of difference was reduced to four-tenths of a foot; at La Grange to four-tenths, and at Quincy to three-tenths above high water of 1888. It is probable had the levees not broken that the water at Quincy would have gone (as it did at Alexandria) to at least 1 foot higher than in 1888. Of course the effect of the prolonged high water was to flatten the river, but it must have also exerted considerable scouring effects where the channel was contracted by our works.

BURLINGTON TO HANBIBAL.

This work was carried on under two contracts with Albert Kirchner. The first one, dated September 8, 1902, approved September 20, 1902, under an allotment of $35,000, was finished October 10, 1903, and the second one, dated July 14, 1903, approved July 31, 1903, under an allotment of $35,000, is not yet finished. Work was begun June 8, 1903, in the vicinity of Fort Madison, Iowa. Dam 10 (sheet 60, mile 452) was raised from a zero stage, to which it was originally built, to a 4-foot stage, and extended across a sand bar overgrown with willows for 1,100 feet. Three Closing Dams, Nos. 16, 19, and 21 (sheet 60, miles 460–461) were repaired by raising them to a 4-foot stage. This work was completed July 28, 1903, and the contractor's fleet transferred to the vicinity of Whitney's bar (miles 533–534).

The gradual movement of the bars downstream at Whitneys had filled the old channel above Dam 1 (sheet 70), and had not yet cut out a new one on the Illinois side of the river. The stage of water was so high that it was a most favorable opportunity for building the dams embraced in the general project for this part of the river and most of the dams were accordingly put in. Six new dams, Nos. 23 to 28, aggregating 6,550 feet in length, were built. Dam 1, which was too low for effective work, was brought up to a 4.5-foot stage for about 1,000 feet. Closing Dam 5, at Turtle Island, had a gap of 260 feet filled and was repaired. Closing Dam 1 (sheet 69, mile 530), at Marion City, was repaired and raised to an 8-foot stage. Closing Dam 6 (sheet 68, mile 525) was raised from a 2-foot stage to a 5-foot stage. The old incomplete shore protection on Armstrong Island was completed from a stage of 8 feet to the top of the bank, 13 feet above low water. A short piece of shore protection, 260 feet long, was built where the current from the gap in Dam 5 (sheet 70) had been cutting into the bank and threatening to destroy the levee. On Island 437, 750 feet of bank was protected, but not finished.

During nearly all of the season of 1903 the contractor was confronted with the usual difficulties occasioned by high water, such as trouble in getting brush, a swift current to work in, and extra difficulty in towing supplies. Mr. Kirchner showed unusual energy and determination, and kept at work when many other men would have given up the struggle, nor did he lay up his fleet until November 14, 1903, just in time to escape being caught by running ice.

The inspectors on this contract work were Mr. R. Monroe, at the beginning, succeeded by Mr. W. T. Pierce the latter half of the season. Both inspectors deserve commendation for intelligent and careful work and strict attention to duty.

List of works constructed and of materials used during the season of 1903, under contracts with Albert Kirchner, between Burlington and Hannibal.

Designation.	Length.	Height above low water 1864.	Rock.	Brush.
Sheet 60 (miles 452–459):	*Feet.*	*Feet.*	*Cubic yards.*	*Cubic yards.*
Closing Dam 10, raised and extended across bar	1,100	4.0	4,881.7	6,720.0
Closing Dam 16, repaired		4.0	1,890.6	2,458.8
Closing Dam 19, repaired		4.0	1,667.3	2,801.3
Closing Dam 21, repaired		4.0	641.3	629.3
Sheet 68 (miles 520–529):				
Closing Dam 6, repaired		5.0	1,184.4	1,902.7
Sheet 69 (miles 529–530):				
Closing Dam 1, repaired		8.0	719.8	971.4
Sheet 70 (miles 530–538):				
Wing Dam 1, repaired		4.5	1,676.1	2,218.4
Closing Dam 5, repaired		6.0	519.7	871.6
Shore protection below closing Dam 5	260	10.0	435.1	320.2
Wing Dam 23	2,200	6.0	4,375.7	9,575.4
Submerged Dam 24 (3 feet high, one course)	1,300		1,118.3	2,276.4
Wing Dam 25	1,350	6.0	2,930.4	6,650.0
Wing Dam 26	650	4.0	1,687.2	2,872.1
Closing Dam 27	250	5.0	557.9	620.5
Submerged Dam 28 (3 feet high, one course)	800		818.7	1,413.3
Shore protection on Island 438, raised to top of bank		13.0	2,684.5	
Shore protection on Island 437 (not completed)	750	12.0	1,007.7	1,034.2
Total			28,796.4	43,335.6

Financial statement for work performed in 1903, between Burlington and Hannibal, under contracts with Albert Kirchner.

1902 contract (entire):		
Amount paid contractor		$32,939.61
Cost of local inspection, etc		1,066.10
Quota of general superintendence and office expenses		1,445.25
Add for use and deterioration of plant		10.30
Total		35,461.26
Material put in works—		
Rock	cubic yards	23,025.9
Brush	do	35,773.2
Total		58,799.1
Average cost per cubic yard in place		0.603
Average cost per cubic yard for inspection		.018
1903 contract (partial):		
Amount paid contractor		11,166.47
Retained percentage on contract		1,240.72
Cost of local inspection, etc		408.22
Quota of general superintendence and office expenses		544.64
Add for use and deterioration of plant		9.00
Total		13,369.05
Material put in works:		
Rock	cubic yards	5,770.5
Brush	do	7,562.4
Total	do	13,332.9
Average cost per cubic yard in place		1.003
Average cost per cubic yard for inspection		.031

On April 6, 1903, 88.2 cubic yards of rock was placed on a badly cutting bank at east end of and just below Dam 1 (sheet 66, mile 506), and extending downstream 125 feet. This work also prevented a crosscurrent from cutting into the levee bank at this point. The work was done by hired labor and use of Government plant, materials being purchased in open market. Contractors McManus & Tucker, of Keokuk, Iowa, furnished 88.2 cubic yards of rock, at 60 cents per cubic yard=$52.92.

DREDGING AT WHITNEYS BAR.

From August 16 to September 17, 1903, the dredge *Phœnix*, with launch *Lucia* as tender, was engaged in opening a channel through the bar at Island 436 (mile 532). Six cuts were made from the foot of Island 436, extending down stream 600 feet, beginning 200 feet out from and running toward the shore, making a channel 150 feet wide and 5 feet deep at low water. A cut 1,500 feet long and 25 feet wide was also made, along the edge of the bar, from the lower end of the first cut to the head of Island 437. This gave a good channel not less than 150 feet wide at this place and with not less that 5 feet at low water. Area dredged, 127,500 square feet.

Financial statement for dredging at Whitneys bar, season of 1903.

Amount expended in field	$2, 536. 72
Add quota of general superintendence and office expenses	107. 82
Add plant charges	544. 03
Total	3, 188. 57
Sand removed ... cubic yards	22, 665. 1
Cost per cubic yard	$0. 1404

SURVEYS.

On July 6, 1903, a survey party was put in the field under the charge of Mr. W. T. Pierce, with a fleet consisting of launches *Stella* and *Edith*, office boat 68, quarter boat 121, and coal-flat G, for the purpose of surveying various points which threatened to become impediments to navigation. Four surveys were made, as follows: Nauvoo to Montrose (miles 470–473); island 409 to island 416 (miles 498–507); island 436 to island 438 (miles 532–536); Dam 7 (sheet 67) to Quincy (miles 519–521). The survey in the first-mentioned locality developed a new channel, which was used for the rest of the season.

This work was completed July 28, 1903, and maps of same have been plotted. The outfit was transferred on July 28, 1903, to Warsaw-Quincy levee, and August 8, 1903, to Mr. C. W. Durham, principal assistant engineer, for work in the vicinity of Rock Island, Ill.

WARSAW-QUINCY LEVEE.

But little work was done on this levee, and consisted mainly in saving life and property, with the aid of such plant as was available in the vicinity, during the disastrous flood of June, 1903. This flood, which was 1 foot higher than any other since 1851, and which may long stand as the record in this division, destroyed an enormous amount of property, mostly in growing crops. The commissioners of the different districts made a heroic struggle against the rising water, but to no purpose. The extreme high water finally caused breaks in the upper end of each district, and of course flooded all the country between the levees and the bluff. The first break occurred in a sandy loam levee at Indian Grave Lake (mile 509). Eyewitnesses say that the break occurred from a mole hole. Men were at work in the immediate vicinity, but after the first gush of water the earth crumbled so fast it was impossible to save the levee, and, as usual, a large crevasse occurred, which in half an hour was over 100 feet wide. The water then flooded all the country between the Bear Creek cross levee and Quincy.

In the upper district two considerable breaks occurred not far below Warsaw, at miles 495 and 499, flooding the whole of the Hunt and Lima Lake districts. The subsequent crevasses were all due to the flood water topping the levees from the inside and thus washing them away. At mile 501, 950 feet of the levee was swept off clean, leaving the original surface of the ground undisturbed. In other cases the water left portions of the levee standing, but washed out the center of the levee in a sort of longitudinal trench down to the base of same. In both the upper and lower districts one very bad crevasse was formed at the lower end of each, through which the flood water escaped. The United States dredge *Phoenix* was used to fill in the base for a repair levee at the break in the Indian Grave district at mile 509. This break was 430 feet long, and the high stage of water made it possible to dredge and dump earth on the line of the proposed repair levee much more cheaply than it could be done by teams. This work was carried on between June 24 and 30, 1903, until the falling stage of water made it necessary to take the plant away. There was dredged and dumped on the proposed line of new levee 8,220.7 cubic yards of mud at a cost of $803.46, or $0.098 per cubic yard.

From July 28 to August 7, 1903, a survey party under Mr. W. T. Pierce, United States inspector, made an examination of the breaks in the levee, and a detailed estimate, by cross sectioning, was made of the earthwork required to restore the levee to its original condition. In all, 21 breaks were cross sectioned, and maps with soundings were made of the larger breaks. The following table gives in detail the result of these examinations.

Table of examinations made and of quantities determined by cross sectioning in Hunt, Lima Lake, and Indian Grave levee districts.

District.	Section.	Mile.	Station.		Length.	Material necessary for repairs.
			From—	To—		
					Feet.	*Cub. yds.*
Hunt	7	495	317+48.5	323+22.5	574.00	14,136.0
Do	10	499	506+24	509+24	300.00	5,128.6
Do	12	501	611+46	620+92	946.00	9,047.2
Do	17	506	850+53	850+90	37.00	118.5
Do	17	506	858+19	858+79	60.00	232.7
Do	17	506	859+40	862+09	269.00	1,957.2
Do	17	506	870+12	872+24	212.00	5,162.9
Do	17	506	879+90	882+22	232.00	2,066.7
Lima Lake	18	506	908+33	910+21	188.00	849.1
Do	18	506	918+31	919+40	109.00	409.3
Do	18	506	920+98	921+61	63.00	258.3
Do	18	506	923+18	924+10	92.00	572.0
Do	18	506	930+00	933+03	303.00	4,249.8
Do	18	506	940+89	944+82	343.00	1,862.6
Indian Grave	28–29	509	1475+90	1480+19.3	429.3	20,634.0
Do	36	516	1854+01	1855+33	132.00	2,743.7
Do	36	518	1882+18	1886+13	395.00	1,537.3
Do	37	518	1936+26.3	1939+08.3	282.00	1,801.2
Do	37	518	1942+54	1945+64.7	310.7	10,164.0
Do	38	518	1952+45	1953+00	55.00	122.0
Do	39	518	2024+17	2028+69	452.00	4,669.2

BAR AT QUINCY, ILL.

Work of removing bar at Quincy, in accordance with my project of September 20, 1903, approved September 23, 1903, was begun September 23, 1903, U. S. suction dredge *No. 203* being employed, with launch *Stella* as tender. Between August 30 and September 23 this dredge was either in transit or undergoing repairs and alterations. The upper part of the stacks was rebuilt, and a good deal of experimenting was done with a view to enlarging her steaming capacity and increasing the percentage of sand pumped. Actual operations began on September 25, and were discontinued October 6 on account of extreme high water, and the fleet returned to the canal to be laid up for the season. On the up trip, owing to the swift current and the insufficient power of the tender, the steamer *Jacob Richtman* was employed to tow the outfit from Quincy to Keokuk. A large number of estimates of the performance of the dredge were made, and the highest percentage of sand was 9. There was not power enough to drive the water at the speed necessary to carry sand through the discharge pipe, the velocity being only about 7 feet per second, instead of 15 feet, which is considered desirable. The dredging done was all at the lower end of the proposed wall or inclosure and was deposited against the bank of the river. The estimated number of cubic yards removed was 6,628; area dredged, 1,200 square yards; depth of cut, about 6 feet below low water; width of cut, about 40 feet.

DREDGING QUINCY BAY.

No work was done in the bay during the past season, except the making of a survey to determine the areas requiring dredging.

I was assisted at different times during the season in my work by Mr. John R.

Carpenter, superintendent; Messrs. R. Monroe and W. T. Pierce, inspectors; Mr. O. S. Willey, clerk; and Mr. W. T. Chambers, recorder; all of whom performed their duties in a way very satisfactory to me.

Very respectfully, your obedient servant,

M. Meigs,
United States Civil Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

REPORT OF MR. A. L. RICHARDS, ASSISTANT ENGINEER.

United States Engineer Office,
Rock Island, Ill., January 1, 1904.

Major: I have the honor to submit the following report of Mississippi River improvement work in the district in my local charge, between Hannbal and the mouth of the Missouri River, during the calendar year ending December 31, 1903.

CHANNEL AND HARBOR AT HANNIBAL.

Improvement of the river at the above-mentioned point was provided for under an allotment of $15,000 in the river and harbor act of June 13, 1902, project approved April 6, 1903. This work was performed by hired labor and use of Government plant, and by an emergency contract for dredging entered into with H. S. Brown, of Quincy, Ill.

The work performed by hired labor consisted in improving the channel at Hannibal by the constructing of Wing Dams 9 and 10 (sheet 71; mile 540), and the extending of Wing Dam 2 (mile 541). All of the work was directly opposite the city. The amount expended in the field was $9,585.61.

The quantity of material used, cost, etc., of this work is shown and included in the tabular statement of day-labor work between Hannibal and the mouth of the Missouri River.

The emergency contract for improving the harbor at Hannibal by dredging entered into September 8, 1903, with H. S. Brown, of Quincy, was for dredging 30,000 cubic yards of material at 15 cents per cubic yard from in front of the steamboat and ferry landings. Operations were begun September 21, 1903, and continued until October 3, 1903, when work was suspended on account of the excessive high stage of water which prevented the dredge from digging to the required grade of 4.5 feet below low water. During this time 5,541.9 cubic yards of material was removed.

HANNIBAL TO MOUTH OF MISSOURI RIVER.

The improvement of this section of the river was carried on under project approved April 6, 1903. This work was performed by hired labor and the use of Government plant, towboat *Coal Bluff* being used for towing.

Brush, delivered on United States barges, was purchased under emergency contracts and oral agreements, and was furnished by G. L. Nichols, James Betts, B. H. Veto, H. Holmes, Joseph Hitz, and Joe Sells. The prices paid ranged from 17 to 22 cents per cubic yard, delivered on United States barges. Owing to the inability of the contractors to furnish the required daily quantity of brush, it was found necessary to place a hired-labor party in the field on July 7, 1903, which party continued cutting brush until September 5, 1903. A total of 8,232.9 cubic yards was cut and loaded on barges by this party at an approximate cost of 27 cents per cubic yard. The increase in cost per cubic yard over the prices paid contractors was occasioned by the continued high stage of water, which kept all the lowland brush fields submerged and made it necessary to go back to the hills and cut hard-wood brush, thereby necessitating a long and expensive haul to the river.

The rock was delivered on United States barges at the quarries and towed by the United States. It was purchased under emergency contracts and was furnished by Hanes & Camery, of Hannibal, Mo. The price paid was 65 cents per cubic yard.

The working season opened July 11 and closed, on account of high water, on October 21, 1903.

The *Coal Bluff* and 12 pieces of plant were laid up for the winter in the harbor at Portage Island, and 13 barges were beached at Grafton, where they are to be repaired before being again placed in commission.

Work was carried on at the following localities during the season: Opposite Hannibal, opposite Louisiana, and in the vicinity of Sterling and Stag islands.

Opposite Hannibal.—Wing Dam 2, built in 1880, was extended 450 feet, and two new wing dams, 9 and 10, were built from the Illinois shore.

Opposite Louisiana.—Wing Dam 1, built in 1881, and used as a roadway for ferryboat passengers and teams, was raised from its former height of 8 feet to a grade of 10 feet above low water. Owing to the high stage it was found to be impossible to properly surface this dam in order to make it suitable for traffic, and this work should be completed early next season.

Vicinity of Sterling Island.—The shore protection on the head of this island was extended down on the channel side of the island for a distance of 1,800 feet.

Vicinity of Stag Island.—A closing dam from Stag Island to the Missouri shore, and one wing dam from the Missouri shore, 1,900 feet above the closing dam, were built during the season.

List of works constructed and repaired and of material used during season of 1903, between Hannibal and mouth of Missouri River (including channel and harbor at Hannibal).

Designation.	Length.	Height above low water, 1864.	Rock.	Brush.
Sheet 71 (miles 540-541):	*Feet.*	*Feet.*	*Cub. yds.*	*Cub. yds.*
Wing Dam 9	800	5	1,507.7	2,682.0
Wing Dam 10	1,300	5	2,529.1	4,721.3
Wing Dam 2, extended	450	(*a*)	574.3	1,816.4
Sheet 75 (mile 568):				
Wing Dam 1, raised	....	8-10	2,181.8	4,305.2
Sheet 79 (mile 600):				
Shore protection, Sterling Island, protected	1,800	13	3,099.9	5,981.4
Sheet 80 (miles 603-604):				
Wing Dam 25	1,000	5	2,640.3	3,981.1
Closing Dam 24	830	5	2,677.4	5,205.6
Total	....	....	15,210.5	28,693.0

a Low water.

Financial statement for work between Hannibal and the mouth of the Missouri River, performed by hired labor during the season of 1903 (including channel and harbor at Hannibal).

Amount expended in field during calendar year 1903	$31,117.83
Quota of general superintendence and office expenses	926.46
Charge for use and deterioration of plant	4,042.55
Total	36,086.84

Material put in works:	
Rock .... cubic yards	15,210.5
Brush .... do	28,693.0
Total	43,903.5

Average cost per cubic yard:	
On barges	$0.371
For towing	.128
For putting in place	.162
For local superintendence and office expenses	.039
For general superintendence and office expenses	.021
For plant	.092
Total	.813

REMOVING WRECKS AND OTHER OBSTRUCTIONS TO NAVIGATION.

On September 18, 1903, dredge *Phoenix*, with launch *Lucia*, quarter boat 47, dump boats 9 and 10, and coal barge 206, were transferred to this division and placed in commission for the purpose of removing sunken rock barge *No. 150* from the channel at a point just below Cincinnati Landing (mile 554), and portions of dams and shore protections in the vicinity of Turners Island. The removal of barge *No. 150* was completed on September 21, and the fleet then proceeded down river to the vicinity of Turners Island, where the shore protection on the tow-head above that island (miles 607) was removed. The dredge was then set at work removing Dam 13 (sheet 80, mile 607), but owing to the continually increasing high stage of water it was necessary to abandon this work on October 7. The dredge and fleet, in tow of U. S. towboat *Coal Bluff*, was then returned to Quincy, arriving there October 8.

It is intended eventually to remove the remainder of Transverse Dam 13 out to its intersection with Trailing-Dam 12, and also that portion of the trailer from the above-mentioned intersection down to its lower end, including the shore protection on the tow-head at the lower end of the trailer.

The cost of this work was $1,200.

SURVEYS.

During the season a survey of Hamburg Bay (miles 586–589) and of the river in the vicinity of Stag Island (miles 603–605) was made. The notes were plotted in the field, and maps of both surveys (with project for improvement work in the vicinity of Stag Island) were submitted to the Rock Island office. The cost of these surveys amounted to $566.88.

Surveys were contemplated in the vicinity of Iowa Island and at Elsah, but owing to the prevailing high stage of water it was considered inexpedient to make them, and the survey party was therefore disbanded on October 3, 1903.

High-water marks of the flood of June, 1903, were established and connected with the proper bench marks at the following-named points: Hannibal, Clarksville, Hamburg, Grafton, Elsah, and Alton. High-water marks were also established on the Sny Island levee for future reference.

IN GENERAL.

The work during the entire season was greatly delayed, and the cost thereof considerably increased, by the scarcity of labor, which caused the various contractors to run behind their quotas in delivering the material on barges. It was also found necessary, in order to keep the day-labor force up to the required number, to pay them an increase of 25 per cent over the wages paid in this district in previous years.

The total length of works constructed under day-labor work during the season of 1903 is as follows: Dams, 4,380 feet; shore protections, 1,800 feet.

In all probability it will be desirable to confine day-labor work next season to the vicinities of Stag and Iowa islands, and Elsah.

It is also desirable that an allotment for contract work be made for work in the vicinity of Clarksville and Moziers Landing. The greater part of this work should be confined to shore protections.

Very respectfully, your obedient servant,

A. L. Richards,
Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

REPORT OF MR. C. W. DURHAM, PRINCIPAL ASSISTANT ENGINEER, ON PLANT.

United States Engineer Office,
Rock Island, Ill., January 2, 1904.

Major: I have the honor to present the following report on the floating stock or plant belonging to the improvement of the Mississippi River, between the mouth of the Missouri River and St. Paul, for the calendar year ending December 31, 1903.

In this report, "good" is in fine condition, wanting slight repairs or none; "fair" requires extensive repairs or such as are advisable; "bad" should be condemned or rebuilt. Pieces condemned during the year are omitted.

The plant in question is as follows: 1 large towboat (*Coal Bluff*), good; 2 medium-sized towboats (*Fury*, *Alert*), good; 1 medium-sized towboat (*Vixen*), fair; 5 small towboats (*Ruth*, *Mac*, *Emily*, *Elsie*, *Lucia*), good; 1 small towboat (*Louise*), fair; 1 small towboat (*Ada*), bad; 1 gasoline launch (*Myra*), good; 1 gasoline launch (*Edith*), bad; 1 dipper dredge (*Phoenix*), good; 1 dipper dredge (*Vulcan*), fair; 2 suction dredges, good; 3 dump boats, good; 3 dump boats, fair; 2 steam-drill boats, good; 1 steam-drill boat, bad; 21 pontons, good; 2 pile drivers, good; 1 pile driver, fair; 8

large quarter boats, good; 4 large quarter boats, fair; 8 small quarter boats, good; 2 small quarter boats, fair: 3 large office boats, good; 1 large office boat, fair; 8 small office boats, good; 5 small office boats, fair; 1 small office boat, bad; 1 derrick boat, bad; 1 store boat, fair; 2 building boats, good; 1 building boat, fair; 2 building boats, bad; 1 sounding boat, good; 32 large barges, good; 36 large barges, fair; 2 large barges, bad; 2 small barges, good; 3 small barges, fair; 2 small barges, bad; and a large number of grasshoppers, loading boats, powder boats, and skiffs, mostly in good condition.

To the snag-boat service belongs the side-wheel steamer *Colonel A. Mackenzie*, good.

The Des Moines Rapids Canal has a small plant, consisting of 1 small towboat (*Stella*), good; 1 dipper dredge (*Ajax*), fair; 4 dump boats, good; 1 small barge, good; 2 small barges, fair.

The Western Section, Illinois and Mississippi Canal, has a gasoline launch, good.

There has been expended on the plant belonging to general improvement, to December 31, 1903, $959,999.08, and its estimated value January 1, 1904, was $136,965.33.

Very respectfully, your obedient servant,

C. W. Durham,
Principal Assistant Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

Y 3.

OPERATING AND CARE OF DES MOINES RAPIDS CANAL AND DRY DOCK.

The Des Moines Rapids Canal was open to navigation during the fiscal year 234 days, during which time there passed through it 713 steamboats and 158 barges, carrying 47,893 passengers, 15,838 tons of merchandise, and 1,278 bushels of grain. There also passed through the canal 9,500,000 feet, board measure, of lumber, 3,400,000 feet of logs, 3,200,000 shingles, and 900,000 laths. This statement is about equal to that of 1903, the canal business in both years being much smaller than usual, on account of the prevailing high stages of the river, which permitted most of the rafts and many boats to pass over the rapids outside of the canal.

The expenses of operating and care of the Des Moines Rapids Canal and dry dock have been, during the past year, $45,161.69, the same being provided for under an indefinite appropriation made by act of July 5, 1884. Nominal repairs were made to the locks and buildings. Dredging was carried on from July 2 to August 18, and from October 12 to November 7, 1903, and from May 2 to June 30, 1904, and amounted to 69,225 cubic yards, which makes the aggregate taken from the canal since June 30, 1878, 1,787,837 cubic yards.

The dry dock was in constant use.

Details of canal and dry dock operations may be found in the report of United States Civil Engineer M. Meigs.

Money statement.

July 1, 1903, balance on hand ($1,076.63 unexpended)	$831.09
June 30, 1904, amount drawn from Treasury during fiscal year under indefinite appropriation	46,871.43
	47,702.52
June 30, 1904, amount expended during fiscal year	45,161.69
July 1, 1904, balance on hand ($3,538.31 unexpended)	2,540.83
July 1, 1904, outstanding liabilities	1,414.69

ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By act approved—	
April 30, 1878	$7,500.00
June 18, 1878 (allotment)	32,500.00
March 3, 1879	40,000.00
June 14, 1880	30,000.00
March 3, 1881, expended during fiscal year ending—	
June 30, 1882	41,771.17
June 30, 1883	77,926.79
June 30, 1884	43,283.42
July 5, 1884, expended during fiscal year ending—	
June 30, 1885	44,506.50
June 30, 1886	43,009.53
June 30, 1887	42,152.84
June 30, 1888	42,802.35
June 30, 1889	38,885.37
June 30, 1890	43,995.80
By act approved—	
July 5, 1884, expended during fiscal year ending—	
June 30, 1891	$44,998.20
June 30, 1892	43,968.92
June 30, 1893	57,057.21
June 30, 1894	55,356.48
June 30, 1895	41,052.80
June 30, 1896	37,555.21
June 30, 1897	33,440.54
June 30, 1898	38,504.95
June 30, 1899	35,118.85
June 30, 1900	39,120.73
June 30, 1901	48,595.91
June 30, 1902	41,805.50
June 30, 1903	40,623.37
June 30, 1904	45,161.69
Total expended	1,130,694.13

Expenditures for operating and care of Des Moines Rapids Canal for fiscal year ending June 30, 1904.

Month.	Office and administration.				Canal and locks.			
	Salaries.	Supplies.	Miscellaneous.	Total.	Labor.	Supplies.	Current repairs.	Total.
1903.								
July	$375.00			$375.00	$1,559.10	$23.73	$181.48	$1,764.31
August	375.00	$8.80		383.80	1,525.00	14.94	104.73	1,644.67
September	375.00			375.00	1,853.59	132.76	63.49	1,779.84
October	375.00	109.20		484.20	1,544.00	177.33	57.14	1,778.47
November	375.00	3.05		378.05	1,703.17	21.69	227.42	1,952.28
December	375.00	94.00		469.00	1,070.43	112.96	238.05	1,421.44
1904.								
January	375.00			375.00	1,012.50	82.44	113.50	1,208.44
February	750.00		$30.71	780.71	1,052.50	244.93	96.50	1,393.93
March	375.00	6.00		381.00	1,109.82	17.03	780.28	1,907.13
April	375.00			375.00	1,550.11	18.60	744.29	2,313.00
May	375.00			375.00	1,482.07	51.18	75.66	1,608.91
June		26.15		26.15	1,382.76	6.75	74.19	1,463.70
Total	4,500.00	247.20	30.71	4,777.91	16,575.05	904.34	2,756.73	20,236.12

Month.	Dredging canal.				Grand total.
	Labor.	Supplies.	Current repairs.	Total.	
1903.					
July	$1,142.97	$579.81	$84.71	$1,807.49	$3,946.80
August	639.19	98.86	69.66	807.71	2,836.18
September		94.45	144.37	238.82	2,393.66
October	850.22	476.62	183.35	1,510.19	3,772.86
November	498.91	92.19	1,686.54	2,277.64	4,607.97
December	150.00	39.59	596.51	786.10	2,676.54
1904.					
January	150.00		1,725.57	1,875.57	3,459.01
February	150.00	54.00	1,225.67	1,429.67	3,604.31
March	150.00		1,308.00	1,458.00	3,746.13
April	1,126.17	456.52	977.12	2,559.81	5,247.81
May	1,466.92	261.15	872.77	2,600.84	4,584.75
June	1,295.20	226.74	1,273.88	2,795.82	4,285.67
Total	7,619.58	2,379.93	10,148.15	20,147.66	45,161.69

In the column of current repairs for dredging canal is included $4,381.20 for a new tender and $3,361.21 for two dump boats.

COMMERCIAL STATISTICS.

Traffic statement of the Des Moines Rapids Canal for the fiscal year ending June 30, 1904.

Month.	Boats up.	Boats down.	Barges up and down.	Passengers.	Merchandise.	Grain.
1903.					*Tons.*	*Bushels.*
July	85	45	21	13,559	2,652	300
August	82	60	31	14,618	3,867	850
September	67	30	31	5,661	2,340	....
October	48	12	20	1,227	450	....
November	30	16	9	302	1,194	....
1904.						
March	3	1	3	....	....	....
April	32	8	10	252	566	....
May	67	10	5	1,441	2,575	....
June	83	34	28	10,833	2,194	128
Total	497	216	158	47,893	15,838	1,278

Month.	Lumber.	Logs.	Laths.	Shingles.	Lockage at one lock.
1903.	*Feet.*	*Feet.*	*Number.*	*Number.*	
July	7,000,000	3,400,000	....	1,200,000	210
August				....	122
September	2,500,000	....	900,000	2,000,000	114
October	....	....	....	....	77
November	....	....	....	....	48
1904.					
March	....	....	....	....	4
April	....	....	....	....	51
May	....	....	....	....	87
June	....	....	....	....	111
Total	9,500,000	3,400,000	900,000	3,200,000	824

REPORT OF MR. M. MEIGS, U. S. CIVIL ENGINEER.

United States Engineer Office,
Keokuk, Iowa, July 1, 1904.

Major: I have the honor to make the following report on "Operating and care of the Des Moines Rapids Canal" during the fiscal year ending June 30, 1904:

The canal was closed for the winter on November 21, 1903, and opened as usual, April 1, 1904, being open two hundred and thirty-four days and closed one hundred and thirty-two days. The stage of water ranged unusually high during the whole of the fiscal year and much of the traffic passed over the rapids. There has been no serious flood in 1904, though the water reached a bank-full stage in the month of April.

REPAIRS TO LOCKS.

Very few repairs have been made or required on the embankment or locks. In the latter part of November and early in December, 1903, a small force was employed to repair the sluice walls at the middle lock.

DREDGING CANAL.

The experience of the past season makes it increasingly evident that the present dipper dredge *Phoenix* is unequal to the task of keeping up with the annual deposit in the canal. Most of this deposit comes from three large creeks emptying directly into the canal prism, and each year the deposit from these creeks becomes heavier as land is broken up along their valleys. The river itself, at high water and during floods, is loaded much more heavily than formerly with sediment, which settles as soon as it enters the still water of the canal. This year (1904), on May 25 and 26, a severe storm actually closed with débris the canal at the mouths of Prices and Lamallees creeks, and two months' dredging with the *Phoenix*, assisted by the suction dredge *Hecla* for two weeks, failed to entirely remove the deposit brought in by Lamallees Creek in two days. The sluice outlet at the mouth of Lamallees Creek becomes choked with drift during the most violent storms and is thereby rendered inoperative, but in ordinary floods it works well and has saved the canal an enormous amount of dredging. Up to the end of this season there will have been dug from the canal prism nearly 2,000,000 yards of deposit, leaving long stretches of the canal—where there is still sufficient depth for navigation—untouched by the dredge. Experiment has shown that a properly built suction dredge can be made to remove these deposits at a fraction of the cost (I estimate at one-third the cost) of dredging by dipper dredge and towing the material out into the river or discharging it through the Sandusky sluice. Provision should be made for a suction dredge to take care of this work. I estimate its cost at $40,000, complete.

From July 2 to August 18 and from October 12 to November 7, 1903, and from May 2 to June 30, 1904, the dredge *Phoenix* and tender *Lucia* were employed in dredging the canal. From April 6 to May 7, 1904, suction dredge *Hecla* and tender *Stella* were also employed cleaning out the mouths of Prices and Lamallees creeks and removing a deposit of mud, 6 feet deep, which obstructed the dry-dock gates. The following is a statement of the amounts and localities dredged during the present fiscal year:

Below lower lock	cubic yards	15,747
Above dry-dock gates	do	400
Vicinity of Prices Creek	do	11,554
Vicinity of Sandusky	do	31,356
Below guard lock	do	7,034
Above guard lock	do	3,134
Total	do	69,225

MACHINE SHOP AT LOWER LOCK.

During the winter months considerable repairs were made to Government plant in the machine shop. The following boats had more or less work done on them: *Mackenzie*, *Elinor*, *Coal Bluff*, *Lucia*, *Stella*, and *Louise*. New engines were built and the ironwork prepared for a dredge tender for the canal (to be named *Grace*), the hull of which is under construction at the dry dock and about 65 per cent finished. Extensive alterations and repairs were made to the machinery of dredges *Hecla* and *Phoenix*. A new building boat (*No. 208*), built at the dry dock, was engined at the machine shop.

OPERATING DRY DOCK.

The dry dock was in operation the whole year. Dredge *Phoenix* received heavy repairs, consisting of new spud wells, new dipper handle, and calking. Two dump boats (*A* and *D*) were built, utilizing the ironwork of former dump boats *No. 8* and *No. 9*. A building boat (*No. 208*), 160 by 24 feet, with launching ways, boiler, pump, and steam capstans, was built. A dredge tender (to be named *Grace*), 80 feet long and 17 feet beam, was still on the stocks at the end of the fiscal year, about 65 per cent completed. The canal tender *Lucia* was docked and heavy repairs made, including new stem, sides, headblock, and guards. Smaller repairs were made to 6 steamboats, 1 dredge, 2 quarter boats, 3 dump boats, and 1 coal flat.

SURVEYS.

A detailed survey of the canal was made, March 31 to April 4, 1904; and on April 28, 1904 (after a storm), a resurvey was made of portions at the mouths of Lamallees and Prices creeks, to show the effect of the storm of April 25–26, 1904.

MISCELLANEOUS.

Weeds and shrubbery on the canal embankment were cut. A carload of crushed stone was used to surface the roads at the lower lock. A small ferryboat (the *Mayflower*), sunk in the upper level of the canal by the ice in November, 1903, was pushed out of the channel and still lies where sunk, but not in the way of traffic. Six models, some of which were used at the World's Fair, were prepared at the lower lock for the Louisiana Purchase Exposition at St. Louis.

I have been assisted by Mr. John R. Carpenter, superintendent; Mr. O. S. Willey, clerk; Mr. W. T. Chambers, recorder, and Mr. W. T. Pierce, inspector, whose services have been uniformly satisfactory and efficient.

Very respectfully, your obedient servant,

M. Meigs,
United States Civil Engineer.

Maj. Jas. L. Lusk,
Corps of Engineers.

Y 4.

OPERATING AND CARE OF ILLINOIS AND MISSISSIPPI CANAL AROUND LOWER RAPIDS OF ROCK RIVER, AT MILAN, ILL.

During the past fiscal year the canal was in operation from July 1 to November 20, 1903, and from April 2 to June 30, 1904, a period of two hundred and thirty-two days, during twenty-one of which Lock 37 was flooded. There passed through it 997 boats and barges, of an aggregate tonnage of 41,601 tons, carrying 2,621 passengers and 544 tons of merchandise. The traffic was about equal to that of the previous year, and will continue to be small until the coal mines are reopened.

Repairs to the canal and its appurtenances were nominal, except that a Taintor gate was built at the Mill Creek sluiceways. Some dredging was performed in Rock River Pool at a shoal crossing near Hilliers Island, 5½ miles above Lock 35, and deposits of sediment at upper approach to Lock 35 and lower approach to Lock 37 were removed. Several surveys were made, the principal one being that of Mill Creek and its water shed.

The expenses of the fiscal year ending June 30, 1904, were $13,198.47, the same being provided for under act of July 5, 1884.

The canal was in local charge of Mr. J. C. McElherne, assistant engineer.

There are no outstanding liabilities.

Money statement.

July 1, 1903, balance on hand	$1.06
June 30, 1904, amount drawn from Treasury during fiscal year under indefinite appropriation	13,588.94
	13,590.00
June 30, 1904, amount expended during fiscal year	13,198.47
July 1, 1904, balance on hand	391.53

ABSTRACT OF ALLOTMENTS.

By act approved July 5, 1884, expended during fiscal year ending—

June 30, 1895	$225.00	June 30, 1901	$4,806.18
June 30, 1896	5,309.17	June 30, 1902	11,014.93
June 30, 1897	4,752.46	June 30, 1903	11,398.94
June 30, 1898	4,502.39	June 30, 1904	13,198.47
June 30, 1899	3,304.92		
June 30, 1900	5,379.84	Total	63,922.30

Summary of expenditures for operating and care of western section Illinois and Mississippi Canal for fiscal year ending June 30, 1904.

Month.	Superintendence, office expenses, supplies, engineering, and contingencies.	Operating and care locks and bridges.	Repairs.	Dredging.	Survey Mill Creek.	Total.
1903.						
July						
August	$1.30	$312.06				$313.36
September		295.00	$381.90	$1,750.00		2,426.90
October		295.00	941.51	693.94		1,930.45
November	17.25	573.33	990.61	1,146.52		2,727.71
December	40.03	245.00				285.03
1904.						
January	78.31	245.00	25.00			348.31
February	115.91	245.00			$138.00	498.91
March	42.78	252.00	10.65		358.65	664.08
April	320.29	295.00		130.50	3.00	748.79
May	101.03	295.00	35.88	738.62		1,170.53
June	340.44	295.00	602.66	846.30		2,084.40
Total	1,057.34	3,347.39	2,988.21	5,305.88	499.65	13,198.47

COMMERCIAL STATISTICS.

Traffic statement of western section of Illinois and Mississippi Canal for the fiscal year ending June 30, 1904.

Month.	Steamers.		Barges.		Number of passengers.	Tons of freight.	Lockages at three locks.
	Number.	Tons.	Number.	Tons.			
1903.							
July	109	919	5	220	800	15	242
August	74	653	3	103	457		132
September	56	1,050	19	1,273	174	93	78
October	168	3,834	87	8,216	311	209	266
November	75	1,705	53	4,626	78	68	159
1904.							
April	47	2,126	40	2,936	121	22	93
May	81	1,836	16	1,535	322	57	156
June	121	3,116	43	7,390	358	46	221
Total	731	15,239	266	26,299	2,621	510	1,347

Statement showing amounts dredged from canal and approaches.

Location.	During year.	Total to date.
	Cubic yards.	*Cubic yards.*
Below Lock 37	18,104	51,392
Above Lock 35	1,566	3,704
Blossomburg Landing		5,000
Rock River Pool, Hilliers Island	5,830	5,830
Total	25,500	65,926

Y 5.

OPERATING AND CARE OF GALENA RIVER IMPROVEMENT, ILLINOIS.

During the past fiscal year the lock was open to navigation from July 1 to November 18, 1903, and from April 12 to June 30, 1904, a period of two hundred and twenty days, during one hundred and three of which the lock was flooded by high water. There passed through it 1,514 boats and barges, carrying 7,538 passengers and 2,040 tons of merchandise. The traffic, although very small, was about double that of the previous year.

Small repairs were made to lock, dam, and grounds, and a deposit of mud was removed from the upper entrance and chamber of lock.

A survey of the entire improvement was made in June, 1904, showing necessary dredging to the amount of 61,432 cubic yards, to restore a 3-foot grade above the lock and 4 feet in Harris Slough. Although no dredging has been done during the past year, the condition of the improvement as regards deposits appears to be much better than a year ago.

The improvement was in local charge of Mr. J. C. McElherne, assistant engineer.

The expenses of the fiscal year ending June 30, 1904, were $2,916.49, the same being provided for under act of July 5, 1884.

There are no outstanding liabilities.

Money statement.

July 1, 1903, balance on hand ($1,062.73 unexpended)	$212.73
June 30, 1904, amount drawn from Treasury during fiscal year under indefinite appropriation	3,050.00
	3,262.73
June 30, 1904, amount expended during fiscal year	2,916.49
July 1, 1904, balance on hand ($3,083.51 unexpended)	346.24

ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By act approved—	
September 19, 1890, purchase of improvement	$100,000.00
July 5, 1884, expended during fiscal year ending—	
June 30, 1894	635.68
June 30, 1895	6,000.00
June 30, 1896	3,400.00
June 30, 1897	8,588.20
June 30, 1898	5,890.05
June 30, 1899	3,226.87
June 30, 1900	8,750.94
June 30, 1901	12,077.01
June 30, 1902	9,166.68
June 30, 1903	2,937.27
June 30, 1904	2,916.49
Total	163,589.19

Summary of expenditures for operating and care of Galena River improvement for fiscal year ending June 30, 1904.

Month.	Superintendence, office expenses, incidental repairs and contingencies.	Operating.		Repairs.	Total.
		Labor.	Supplies.		
1903.					
July		$160.00			$160.00
August	$57.00	160.00			217.00
September		160.00		$27.03	187.03
October			$22.07		22.07
November		160.00		152.75	312.75
December		320.00		324.73	644.73
1904.					
January		120.00			120.00
February		120.00	28.77		148.77
March	1.83	149.33			151.16
April	4.99	160.00		125.00	289.99
May	200.00	160.00			360.00
June	7.99	160.00		135.00	302.99
Total	271.81	1,829.33	50.84	764.51	2,916.49

COMMERCIAL STATISTICS.

Traffic statement of the Galena River improvement for the fiscal year ending June 30, 1904.

Month.	Boats up and down.	Passengers.	Merchandise.	Lockages.
1903.			*Tons.*	
July	196	1,214	54	53
August	207	1,184	100	161
September	203	1,079	158	99
October	200	613	561	
November	75	250	2	36
1904.				
April	53	136	260	13
May	194	705	535	50
June	386	2,357	368	109
Total	1,514	7,538	2,038	521

Y 6.

IMPROVEMENT OF HARBOR AT LA CROSSE, WISCONSIN.

No work was done under the above heading during the past year.

Money statement.

July 1, 1903, balance unexpended	$1,964.35
July 1, 1904, balance unexpended	1,964.35

ABSTRACT OF APPROPRIATIONS.

By act approved—

June 3, 1896 (allotment)	$5,000
March 3, 1899	12,000
Total	17,000

Y 7.

PRELIMINARY EXAMINATION OF INNER HARBOR AT LAKE CITY, MINNESOTA.

[Printed in House Doc. No. 182, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated July 10, 1902, by Maj. C. McD. Townsend, Corps of Engineers, on preliminary examination of inner harbor at Lake City, Minn., with a view to securing a harbor of refuge. This examination has been made in pursuance of a requirement in the river and harbor act approved June 13, 1902, and Major Townsend is of the opinion, concurred in by the division engineer, Lieut. Col. O. H. Ernst, Corps of Engineers, that the improvement of the locality as proposed is not desirable.

This report has been reviewed by the Board of Engineers for Rivers and Harbors, under the provisions of sections 3 and 14 of the above-mentioned act, and for reasons given in its report of January 8, 1903, the Board states that it is not desirable for the United States to undertake this improvement.

I concur in the opinion of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF MAJ. C. M'D. TOWNSEND, CORPS OF ENGINEERS.

United States Engineer Office,
Rock Island, Ill., July 10, 1902.

General: The river and harbor act of June 13, 1902, provides for a preliminary examination of "inner harbor at Lake City [Minn.], with a view to securing a harbor of refuge."

The so-called inner harbor is a pond situated in the point of land that extends into Lake Pepin at Lake City, as is shown on accompanying map.[a] The area of this pond is about 520,000 square feet, and at low stages of the river it is mostly swamp. To dredge this to a suitable depth, say 6 feet at low water, would necessitate the removal of about 140,000 cubic yards of material, and it would also be necessary, in order to complete the work, to cut a sufficiently wide passage into this pond from the outer harbor. As this pond is at present in no way a part of or tributary to the river it would probably be obligatory on the part of the United States to purchase the swamp and the surrounding ground if any improvement should be undertaken. It is therefore evident that the cost of the improvement, as well as its maintenance, would be considerable.

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[a] Not printed.

Lake City has about 3,000 inhabitants, and its local river commerce is small. An inner harbor would benefit a few firms by enabling them to procure lumber by river instead of by rail, and save thereby the difference in freight on about 1,000,000 feet of lumber. Such a harbor would be a boon to pleasure launches and skiffs, and also to the little ferryboat which carries annually to various points on the lake about 24,000 passengers, 12,000 teams, 800 tons of freight, and 500 head of cattle. The ferryboat would land in the inner harbor and remain there overnight. In so doing she would not feel the effect of winds, which now compel her to land on one side or the other of the point, according to their direction.

There is already a harbor of refuge at Lake City which is a benefit to the through navigation of the river as well as to local commerce. The inner harbor would be of no use to through navigation. The present harbor is made safe by a pier built by the United States in 1887. This pier is 871 feet long and cost $25,000. It has occasionally happened that in time of storm, when rafts have sought this harbor for safety, its area was insufficient to also accommodate the ferryboat and other craft; but the remedy for this would be to lengthen the pier about 200 feet, which could be done at comparatively small expense.

In view of the small commercial interests to be benefited by the inner harbor at Lake City, this expensive work is not, in my opinion, advisable, and I do not recommend any further surveys or estimate.

Very respectfully, your obedient servant,

C. McD. Townsend,
Major, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Northwest Division,
Chicago, Ill., July 12, 1902.

Respectfully forwarded to the Chief of Engineers.

I concur in the opinion expressed by the officer in charge that the improvement of inner harbor at Lake City, Minn., with a view to securing a harbor of refuge, is not advisable.

O. H. Ernst,
Lieut. Col., Corps of Engineers,
Division Engineer Northwest Division.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
August 15, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

The accompanying papers are inclosed for the information of the Board.

A. Mackenzie,
Acting Chief of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 8, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Major Townsend on the preliminary examination of inner harbor at Lake City, Minn., with a view to securing a harbor of refuge, the indorsement of the division engineer, and letters from interested parties.

An exterior harbor now exists at Lake City which is of almost sufficient capacity to meet present demands; a small extension of the pier would supply the deficiency. This harbor is of benefit to through navigation as well as local commerce. The construction of an additional "inner harbor" would benefit local and not general commerce, and would probably involve serious questions of property rights.

The Board is compelled to believe that it is not desirable that the United States should undertake this improvement.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

Y 8.

PRELIMINARY EXAMINATION AND SURVEY OF MISSISSIPPI RIVER AT MOLINE, ILLINOIS.

[Printed in House Doc. No. 397, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, January 5, 1904.

SIR: I have the honor to submit herewith reports dated August 22, 1902, and March 20, 1903, with map,[a] by Maj. C. McD. Townsend, Corps of Engineers, on preliminary examination and survey, respectively, of the Mississippi River at Moline, Ill., with a view to the construction of a lock, made in pursuance of a requirement in the river and harbor act approved June 13, 1902.

Major Townsend considers the city of Moline of sufficient commercial importance to justify the proposed improvement if it can be made at reasonable expense, and a survey with plan and estimate was ordered accordingly. The project proposed by him contemplates the excavation of a channel 250 feet wide with a depth of 4 feet at low water, from the city of Moline to the head of the so-called arsenal dike above the city and a similar channel connecting with the main river by means of a lock and dam at the foot of Benhams Island opposite the city, the estimated cost of the work being $386,000, and $10,000 annually for operation, care, and maintenance.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors, under the provisions of sections 3 and 14 of the above-mentioned act, and attention is invited to its reports in indorsements dated October 14, 1902, and December 21, 1903. I concur in the opinion of the Board as expressed in its latter report, and believe that it is desirable for the United States to construct a lock in the Mississippi River at Moline, Ill., in general accordance with the plan of the district officer, and with such changes in details as may seem desirable at the time of construction.

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[a] Not reprinted; printed in House Doc. No. 397, Fifty-eighth Congress, second session.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

PRELIMINARY EXAMINATION OF MISSISSIPPI RIVER AT MOLINE, ILL.

UNITED STATES ENGINEER OFFICE,
Rock Island, Ill., August 22, 1902.

GENERAL: The river and harbor act of June 13, 1902, provides for a preliminary examination of Mississippi River at Moline, Ill., "with a view to the construction of a lock." In compliance with instructions contained in your letter of June 23, 1902, I have the honor to submit the following report thereon:

A preliminary examination of "Moline City Harbor, Illinois," was made by Maj. (now Col.) A. Mackenzie, Corps of Engineers, in 1888, as provided for by river and harbor act of August 11, 1888. Major Mackenzie's conclusions at that time were that—

> While the desirability of a good and convenient harbor at Moline, if it be practicable to have one at reasonable expense, must be acknowledged, the enormous cost which would attend the construction of a harbor at the locality proposed and the approach thereto, so that the largest steam craft running on the upper Mississippi may be able to land at the lowest stages of water, leads me to the conclusion that the Moline City Harbor is not worthy of improvement by the General Government.

The matter was dropped for the time, and no survey was made. The report on this examination, which was rendered December 7, 1888, may be found in the Report of the Chief of Engineers for 1889, pages 1771–1781. A second preliminary examination, ordered by river and harbor act of July 13, 1892, was made, and reported on by Major Mackenzie, November 7, 1892. He states that—

> While the rock excavation recently carried out, under the direction of the commandant of the Rock Island Arsenal, reduces somewhat the former estimate of cost, it still remains my opinion that the cost of work necessary for completing such a channel is not justified by the interests of navigation involved.

The above report is published in Report of the Chief of Engineers for 1893, pages 2253–2254.

The recent extension by the Ordnance Department, United States Army, of the longitudinal water-power dam running upriver from the head of Rock Island (shown on the accompanying map[a]) has created a navigable pool in front of Moline and obviates the necessity of much of the rock excavation, which was the chief factor in the estimate of cost in the plans considered in former years.

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[a] The only map printed herewith is one that accompanied the report on survey.

This pool connects with the main river above the dam, but it is deemed probable that considerable dredging of mud and sand and possibly some rock excavation may be necessary at the head of the pool to afford a navigable entrance to Moline Harbor.

The following extracts from a memorial from the business men and citizens of Moline to Congressman George W. Prince, calling attention to the need of a suitable harbor at Moline, give information concerning the commercial importance of the city.

The water between the river front of this place and the navigable channel of the river has heretofore been too shallow to allow the landing of boats, and, as the bed of the river between those points is of solid stone, the water could be artificially deepened only by the removal of this stone at such great expense as to render the undertaking impracticable. Moreover, the position of the Government (water power) wing dam between the city and the main channel has made access by water both indirect and inconvenient. Such conditions, however, have been recently changed by the Government completing the extension of that dam some 8,000 feet upstream to a point above the upper limits of the city, and while the latter is now more completely cut off from direct access to the channel, yet the dam has formed between itself and the Illinois shore a navigable canal or pool, and has permanently raised the low-water level in front of the city about 4 feet. This canal, opening at its upper end directly into the main river, extends downstream along our river front and along both sides of the upper end of the island of Rock Island to the water-power dams between that island and the Illinois shore and Benhams Island.

Under the present conditions it is entirely feasible, at a very moderate expense, to provide a deep and commodious harbor for this city, as well as one for the island of Rock Island, and at the same time make the navigation of the lower part of the Rock Island Rapids easy and safe. To accomplish these things it is proposed that the Government build and operate a steamboat lock in the existing dam between the island of Rock Island and Benhams Island, so that steamboats and other craft may pass from the main river into the lower end of the canal, and vice versa. No lock will be required at its upper end, since it opens at the same level directly into the main river. Slack-water navigation will then be possible throughout the entire length of the canal, both in ascending and descending the river, and boats can thus avoid the swiftest and most dangerous part of the rapids, and can easily and safely land at the shores of Rock Island Arsenal and at this city.

This improvement would also, upon completion of the Illinois and Mississippi Canal, give a direct water communication with the Great Lakes and eastern tidewater, and permit the canal boats and barges to reach Moline without difficulty inasmuch as that part of the Mississippi River between the mouth of the canal and the proposed lock—about 6 miles—can be easily navigated. This should result in a pronounced gain to the canal tonnage.

Without a harbor, Moline is deprived of the benefits of cheap water transportation. This deprivation is the more severely felt because Moline is a great manufacturing center—in fact, the greatest on the Mississippi River between St. Louis and St. Paul—receiving and shipping over 600,000 tons of freight per year. Its finished products, like the raw material used, are mostly heavy and bulky articles well adapted to water transportation and such as would secure low-freight charges. With a harbor of the kind proposed, boats and barges could be unloaded and loaded directly at the premises of most of the large factories, thus reducing the cost of handling freight to a minimum.

Water communication with the Atlantic and Gulf seaboards would facilitate the distribution of the city's products and promote its export trade; it would give an impetus to the city's industries and the benefits would be diffused to the iron and coal mines of the East and to the forests of the North and to the South, the great sources of the raw material used.

The proposed improvement will also give a deep, convenient, and commodious harbor to the island of Rock Island, upon which is situated the Rock Island Arsenal. Boats and barges can then be unloaded and loaded at places on the shores of the island near the shops and warehouses, and heavy ordnance, stores, and material can be shipped by all-water routes to and from the eastern and southern seaboards.

The plan of improvement offers no engineering difficulties, and is regarded as entirely practicable by those skilled in such matters. It has the approbation of the river transportation interests, inasmuch as its execution would work a permanent improvement of navigation as well as open a large industrial and shipping port to river traffic.

The direct benefits to be derived from the improvement may be briefly summarized as follows:

I. A safe and convenient harbor for Moline.

II. A safe and convenient harbor for the Rock Island Arsenal.

III. The elimination of the lower part of the Rock Island Rapids as a hindrance to the navigation of the Mississippi River.

IV. An increased tonnage of river and canal shipping.

The engineers whom we have consulted estimate that the improvement would cost about $85,000.

The construction of a lock at Benhams Island, as proposed, would probably be more costly than is estimated in the memorial. It would occupy the site of one of the locks of a lateral canal required to surmount the Rock Island Rapids, if the commerce of the river ever becomes sufficiently great to justify the construction of such a canal, and should at least have the dimensions of the locks of the Des Moines Rapids Canal, viz, 350 feet in length by 80 feet in width.

The census for 1900 gives Moline a population of 17,248. There were 450 factories, with a combined capital of $14,126,834. The cost of materials used in manufacture was $6,928,941, and the value of the products $12,586,116. During the year ending June 30, 1902, the tonnage of the manufactures received and shipped by rail by the leading factories was approximately 500,000 tons, which would probably be increased to 600,000 tons had it been practicable to secure accurate figures from small manufacturing concerns.

Moline is considered a city of sufficient commercial importance to justify the construction of a navigable connection between its harbor and the Mississippi River, if it can be obtained at reasonable expense, and a survey for the purpose of determining the cost of making such a connection is respectfully recommended.

If the survey is made an allotment of $500 from the act approved June 13, 1902, will be required.

Very respectfully, your obedient servant,

C. McD. Townsend,
Major, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Northwest Division,
Chicago, Ill., August 25, 1902.

Respectfully forwarded to the Chief of Engineers, United States Army, the allotment of $500 for a survey recommended.

O. H. Ernst,
Lieut. Col., Corps of Engineers,
Division Engineer, Northwest Division.

[Second indorsement.]

Office Chief of Engineers, U. S. Army,
September 5, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters Corps

of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
October 14, 1902.

Respectfully returned to the Chief of Engineers.

The Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters Corps of Engineers, current series, under provisions of section 3 of the river and harbor act of June 13, 1902, has examined and reviewed the within report of Maj. C. McD. Townsend, Corps of Engineers, on the preliminary examination of the Mississippi River at Moline, Ill., with a view to the construction of a lock.

The Board is of the opinion that the construction of a lock at this place would be of benefit, by adding to the harbor at Moline and affording a navigable connection with the Mississippi River, as well as by improving the navigation of the river at a point where such improvement is needed, but is unable to determine whether the work should be undertaken until further data as to the cost of the improvement shall become available.

Without, therefore, expressing at this time an opinion as to the advisability of the improvement, the Board recommends that a survey, with estimate of cost, be made as recommended by the district officer and the division engineer.

For the Board:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
October 17, 1902.

Respectfully submitted to the Secretary of War.

This is a report on preliminary examination of Mississippi River at Moline, Ill., with a view to the construction of a lock, as authorized by the river and harbor act of June 13, 1902.

Inviting attention to the report of the Board of Engineers in the preceding indorsement, I recommend that a survey of the locality be made as proposed.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S Army.

[Fifth indorsement.]

WAR DEPARTMENT,
October 22, 1902.

Approved as recommended by the Chief of Engineers.

By order of the Secretary of War:

JOHN C. SCOFIELD,
Chief Clerk.

[Sixth indorsement.]

Office Chief of Engineers, U. S. Army,
April 7, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with report of survey as recommended.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Seventh indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., December 21, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

In third indorsement hereon the Board of Engineers for Rivers and Harbors expressed the opinion "that the construction of a lock at this place would be of benefit, by adding to the harbor at Moline and affording a navigable connection with the Mississippi River, as well as by improving the navigation of the river at a point where such improvement is needed, but is unable to determine whether the work should be undertaken until further data as to the cost of the improvement shall become available."

The Board has considered such further data as contained in the accompanying report of the district officer on a survey and estimate.

The district officer reports that an improvement, as contemplated in the act of June 13, 1902, can be accomplished at an estimated cost of $386,000, with $10,000 per annum for care and maintenance. The plan proposed by the district officer provides for a lock with a navigable depth of 5 feet and a channel of approach with a depth of 4 feet, capable of development, should the demands of commerce make it necessary, to a like depth of 5 feet.

The Board is of opinion that the estimate of cost of this improvement is reasonable when compared with resulting commercial benefits. An excellent harbor would be secured for the important manufacturing town of Moline, Ill., and a route provided for through commerce which would avoid several of the steepest chains of the Rock Island Rapids. It is believed, therefore, that it is desirable for the United States to construct a lock in the Mississippi River at Moline, Ill., in accordance with the plans of the district officer, at an estimated cost of $386,000 and $10,000 per annum for care and maintenance, and the Board so recommends.

For the Board:

A. M. Miller,
Lieut. Col., Corps of Engineers,
Senior Member Present.

SURVEY OF MISSISSIPPI RIVER AT MOLINE, ILL.

United States Engineer Office,
Rock Island, Ill., March 20, 1903.

General: In compliance with instructions contained in your letter of October 31, 1902, I have the honor to submit the following report on a survey and estimates "with a view to the construction of a lock" in the Mississippi River at Moline, Ill.

A description of the survey, with detailed estimates, will be found in the appended report of Assistant Engineer C. W. Durham. The estimated cost of the work, as fully projected, is $386,000, and the estimated cost of operating, care, and maintenance is $10,000 per annum.

The survey discloses that a navigable waterway with a depth of 3 feet at low water exists from the head of the arsenal dike to the city of Moline, and that by the excavation of 23,611 cubic yards of rock and 20,842 cubic yards of earth a channel 250 feet wide, with a depth of 4 feet at low water, can be obtained. This channel affords a navigable connection between the pool in front of the city of Moline and the Mississippi River, but the citizens desire a closer communication by means of a lock situated opposite the town, as stated in the petition quoted in my report on the preliminary examination, dated August 22, 1902.

Moline and Duck Creek chains, opposite the arsenal dike, have steeper slopes than exist on any other portion of the Rock Island Rapids, and any vessel going upstream must pass over these chains before it can enter Moline pool, thus materially adding to the cost of transportation of all products arriving from lower parts of the river. A packet proceeding up the river, if not intending to land at Moline, would derive little advantage from the proposed lock, as the time occupied in going through the lock and pool would probably exceed that of passing over the chains; but a towboat with a heavy tow would be considerably benefited thereby.

The great benefit that would accrue to Moline from the construction of the lock is due to the fact that the packets running up and down the river from Rock Island and Davenport do not have the time to enter and depart from Moline pool without seriously interfering with their existing schedules, but with the proposed lock constructed these boats could touch at Moline without causing serious delay, and its merchants would be on an equality with those of Rock Island and Davenport in competing for the trade of river towns.

The construction of this lock is considered more worthy of consideration by the General Government than any of the local improvements for which allotments have been made in recent years from the appropriation for improving the Mississippi River between St. Paul and the mouth of the Missouri River. It is not only of considerable benefit to the local commerce of Moline, but incidentally of some value to through navigation. Attention, however, is invited to the fact that every allotment from the general appropriation for local improvements delays to that extent the completion of the general project for the improvement of the river.

Very respectfully, your obedient servant,

C. McD. Townsend,
Major, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,
Chicago, Ill., April 3, 1903.

Respectfully forwarded to the Chief of Engineers, recommended for approval.

O. H. ERNST,
Colonel, Corps of Engineers,
Division Engineer, Northwest Division.

REPORT OF MR. C. W. DURHAM, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Rock Island, Ill., March 16, 1903.

MAJOR: In compliance with your instructions, I have the honor to report on a survey of the Mississippi River at Moline, Ill., with a view to the construction of a lock. The field work was in charge of Junior Engineer A. J. Stibolt, and was performed in January and February, 1903. The accompanying maps were made in February and March, 1903.

The survey commences about 400 feet above the upper end of the new water-power dike built in 1901. The main transit and level line runs down the Illinois shore to the People's Power Company dam, and thence, from a triangulated point on Arsenal Island (Rock Island) opposite, to the arsenal dam. A branch line crosses from the Illinois shore at Twentieth street, Moline, to the dike, and thence down the dike and Benhams Island, across the Sears dam, and down Arsenal Island to a point about 1,500 feet above the head of Pappoose Island.

The stretch of pool and river covered by this survey is about 4 miles in length. The sounding lines were laid out from 50 to 200 feet apart, according to circumstances, and the soundings were made with a level, holes being cut in the ice for the purpose. The cross sections extended to the top of the bank on both sides, so that complete profiles were obtained of both shores and of the crest of the long dike.

The probable extreme low-water elevation at the head of the dike (573.8 feet above Cairo datum) was used in reducing all levels in the pool and on neighboring shores and dike to a low-water comparison, this elevation being assumed as the low-water plane of the entire pool, extending to the arsenal dam on the south and to the site of the proposed lock on the north side of Arsenal Island. The low water of 1864 at a point corresponding to the head of the dike (which was not built until 1901) was 572.3 feet, but contraction works at Duck Creek chain, together with the dike itself, have raised the low-water surface 1.5 feet.

The figures in the pool, therefore, represent the depths in feet at low water and indicate a rock bottom except where marked sand (s), gravel (g), and mud (m). The + figures (in red on the tracing) are the elevations in feet above low water. The figures in the river below and outside of the proposed lock show depths at low water derived from the appropriate low-water determinations. On the maps are indicated the proposed lock, which is similar in dimensions to the locks at the Des Moines Rapids Canal, having an area in chamber of 350 by 80 feet and a depth on miter sills of 5 feet at low water, and the dam, running from a point on Benhams Island to the lock, the crest elevation of this dam being 2 feet above high water. The proposed channel, 250 feet in width, is laid down commencing at the head of the dike and extending to the proposed lock on the right and to Moline Landing on the left, showing a considerable widening at the head of Arsenal Island and an ample basin at Moline for turning. The large map also gives a profile showing lines of low water, high water, 1888, of crests of dike and proposed dam, bottom of river from Benhams Island to the lock, and center of proposed channel from head of water-power dike to the lock. Sections of proposed lock and dam are also given.

I have prepared an estimate for a through channel 250 feet wide and 4 feet in depth at low water, extending from the head of the water-power dike, where deep-water connection is made with the main channel of the river to the proposed lock, and through the lock to the main channel of the river below the lock; for a side channel to the Moline Landing, including a considerable widening where the channels diverge, and a large basin above the bridge; for a lock and dam (the former having the same chamber dimensions and depth on miter sills as those of the locks at the Des Moines Rapids Canal, and the latter those of the canal wall); for the removal of the old

Sears dam and repairs to the new water-power dike. In this estimate the rock excavation in the channel and lower approach to the lock is to be performed by drill boat and dredge, and the earth excavation by dipper and pump dredges. The lock is to be built of concrete masonry and operated by electricity transmitted from the arsenal power plant. The dam is to have an earthern core, surfaced on sides with riprap rock of an average thickness of 2 feet. The rock and a portion of the earth used in the dam and the filling between lock and shore will be dredged material taken from the improved channel. The 4-foot grade is that adopted and hitherto adhered to in the improvement of the Rock Island Rapids. The lock and its lower approach is planned and estimated for a 5-foot grade in anticipation of a future deepening of the channel of the Rock Island Rapids.

Estimate for 4-foot grade in channel, 5-foot grade in lock and lower approach.

Lock:		
Rock excavation for chamber, 6,000 cubic yards, at $4	$24,000	
Earth fill between lock and shore, 28,000 cubic yards, at 25 cents	7,000	
Cofferdam and pumping	20,000	
Concrete masonry, 13,000 cubic yards, at $8.50	110,500	
Gates	15,000	
Machinery, culvert gates, motors, and power transmission	8,500	
		$185,000
Dam:		
Earth (part dredged material), 56,864 cubic yards, at 25 cents	14,216	
Rock (all dredged material), 10,000 cubic yards, at 50 cents	5,000	
		19,216
Rock excavation:		
Channel, 250 feet wide, from head of dike downstream, 23,611 cubic yards, at $4	94,444	
Lower approach to lock, 10,082 cubic yards, at $4	40,328	
Removing Sears dam, 1,700 cubic yards, at $4	6,800	
		141,572
Earth, sand, and gravel excavation, 20,842 cubic yards, at 15 cents		3,126
Repairs to dike		2,000
Superintendence, engineering, and contingencies, 10 per cent		35,091
Total		386,005

I would say that with a 4-foot approach and 4 feet on the miter sills of the lock, this estimate will be reduced about $24,000, making it in round numbers $362,000.

I also beg leave to present a supplementary estimate contemplating a 4-foot grade (at extreme low water) in the lock and lower approach and in a great part of the channel as laid out, and a 3-foot grade in the remainder of the channel. It will be noted on reference to the map that at a 1-foot stage or over there will be a channel of ample width and depth throughout. Our gauge records show that during the past ten years, between April 1 and November 15 (which is the navigation season), the river has been at a stage of 1 foot and over 2,077 days and at a stage of less than 1 foot 213 days, or less than 10 per cent. As even at the very lowest stages there would be quite as much water in the proposed channel as at many points in the main river, it appears to me that an improvement providing for no channel rock excavation and only sufficient earth excavation to make a good landing at Moline, will accommodate the present needs of commerce.

Supplementary estimate for 3-foot grade at extreme low water in the pool, 4 feet on miter sills of lock and in lower approach.

Lock:		
Rock excavation for chamber, 4,300 cubic yards, at $4	$17,200	
Earth fill between lock and shore, 28,000 cubic yards, at 25 cents	7,000	
Cofferdam and pumping	20,000	
Concrete masonry, 12,550 cubic yards, at $8.50	106,675	
Gates	15,000	
Machinery, culvert gates, motors, and power transmission	8,500	
		$174,375
Dam:		
Earth, 56,864 cubic yards, at 30 cents	17,059	
Rock (all dredged), 10,000 cubic yards, at 50 cents	5,000	
		22,059

Rock excavation:		
Lower approach to lock, 6,682 cubic yards, at $4	$26,728	
Removing Sears dam, 1,700 cubic yards, at $4	6,800	
		$33,528
Earth dredging at Moline, say, 5,000 cubic yards, at 15 cents		750
Repairs to dike		2,000
Superintendence, engineering, and contingencies, 10 per cent		23,271
Total		255,983

For a 5-foot grade in lock and approach, $24,000 should be added to above estimate, making in round numbers $280,000.

Two maps accompany this report, the smaller of which is suitable for publication. The larger one, scale 1:2,400, was used in preparing estimates.

Very respectfully, your obedient servant,

C. W. Durham,
Assistant Engineer.

Maj. C. McD. Townsend,
Corps of Engineers.

Y 9.

PRELIMINARY EXAMINATION OF THE EAST BANK OF THE MISSISSIPPI RIVER FROM QUINCY, ILLINOIS, TO SNY LEVEE.

[Printed in House Doc. No. 80, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report dated July 28, 1902, by Maj. C. McD. Townsend, Corps of Engineers, on preliminary examination of the east bank of the Mississippi River from Quincy, Ill., to Sny levee, with a view to improving navigation by preventing the water from overflowing the natural and artificial banks along that part of the river, and deepening the channel, made in compliance with a requirement in the river and harbor act of June 13, 1902.

The project for improving the Mississippi River at this locality contemplates utilizing only the low-water discharge of the river by means of contraction works, while the improvement contemplated by the proviso of the act involves the construction of a levee from Quincy to the Sny levee for the purpose of using the high-water forces for deepening the low-water channel. In the opinion of Major Townsend, which is concurred in by the division engineer, Lieut. Col. O. H. Ernst, Corps of Engineers, substitution of levee construction for the existing project as a means of improving navigation and deepening the channel is not advisable, and the Board of Engineers for Rivers and Harbors, which has reviewed this report under the provisions of sections 3 and 14 of the above-mentioned act, states in its report of March 17, 1903, that it is not desirable for the United States to undertake this improvement.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF MAJ. C. M'D. TOWNSEND, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Rock Island, Ill., July 28, 1902.

GENERAL: The river and harbor act of June 13, 1902, provides for a preliminary examination of—

> The east bank of the Mississippi River from the city of Quincy to Sny levee, with a view to improving navigation by preventing the water from overflowing the natural and artificial banks along that part of the river and deepening the channel.

Your letter of June 23, 1902, assigns this duty to me.

To prevent the water from overflowing the banks a levee would be required running from high ground at Quincy to the river, thence down the river bank to a point opposite the upper end of the Sny levee and back across country to connect with the Sny levee. Cross levees on both sides of Mill Creek would probably be needed.

The approximate alignment of such a levee is shown in red on the accompanying map.[a] It would be about 12 miles in length and would benefit, to a greater or less extent, about 7,600 acres of land, but would have no appreciable effect in channel improvement. A rough estimate of the cost of the levee, including drains, right of way, etc., is $10,000 per mile, or $120,000. The increase in value of the land benefited would be about $20 per acre, or $152,000.

The project adopted for improving the navigation and deepening the channel of the Mississippi River contemplates utilizing only the low-water discharge of the river for the purpose. The low-water channel of the river is contracted by closing dams, wing dams, and bank revetment, to a width dependent upon the low-water discharge at the locality. Between Quincy and Hannibal this width is 1,300 feet, and the contracting wing dams are given a height of from 4 to 5 feet above low water. The water at high stages is unrestrained, but at low stages is confined to the channel between the works of contraction. The experience of the past twenty-five years on the river has shown that the height to which wing dams are constructed is ample to attain the results required by the project.

The proviso of the river and harbor act of June 13, 1902, under which this examination is made, contemplates the improvement of the portion of the river between Quincy and the Sny levee, by preventing the water from overflowing the natural and artificial banks, i. e., by utilizing the forces exerted at high water for deepening the low-water channel, but it is not clear whether this is proposed as a substitute for the existing project or as an addition thereto. As the low-water contraction of the river in accordance with the existing project produces the depth of channel desired, an additional expenditure for the purpose appears superfluous.

The substitution of levee construction for the existing project as a means of improving navigation and deepening the channel is not considered advisable. The experiment of improving navigation by preventing the water from overflowing the natural and artificial banks has been repeatedly made on the upper Mississippi River.

The Sny levee, built 1872–1874 by private parties, extends from the bluffs below Quincy to Hamburg Bay, a distance of 51 miles, and protects from overflow about 124,500 acres of land. The Warsaw to Quincy levee, also built by local levee boards, has a length of about 40 miles and protects 52,000 acres. The levee from Iowa River to Flint Creek was built by the General Government, and has a length of 35¼ miles and protects 44,700 acres. The influence of these levees on the low-water channel of the river is inappreciable.

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[a] Not printed.

The cost of a survey will be about $600. The work is considered of no importance to the commerce of the river, present or prospective, and therefore a survey is not deemed advisable.

Very respectfully, your obedient servant,

C. McD. TOWNSEND,
Major, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,
Chicago, Ill., July 29, 1902.

Respectfully forwarded to the Chief of Engineers, United States Army.

I concur in the opinion that the improvement described in the act is not advisable.

O. H. ERNST,
Lieut. Col., Corps of Engineers,
Division Engineer, Northwest Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 15, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 17, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer, the indorsement of the division engineer, and several letters from interested persons.

In the opinion of the Board the work contemplated in the act would have no effect in improving navigation and deepening the channel of the river. The only benefit to be expected would be the protection from overflow of some 7,600 acres of private property.

The Board therefore believes that it is not desirable for the United States to undertake this improvement.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

Y 10.

PRELIMINARY EXAMINATION AND SURVEY OF QUINCY HARBOR AND BAY, MISSISSIPPI RIVER, ILLINOIS.

[Printed in House Doc. No. 112, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 1, 1903.

SIR: I have the honor to submit herewith reports, dated July 14, 1902, and December 19, 1902, with map,[a] by Maj. C. McD. Townsend, Corps of Engineers, on preliminary examination and survey of Quincy Harbor and Bay, Illinois, authorized by the river and harbor act approved June 13, 1902.

Operations have been carried on by the United States for improving Quincy Bay, with a view to deepening the channel across the bar in the river in front of the city of Quincy, and for improving the bay for use as a winter harbor, for the accommodation of commerce, by dredging an area of about 90 acres to a depth of 6 feet at low water. The river and harbor act of June 13, 1902, appropriated $20,000 for the improvement of Quincy Bay and for removing the sand bar at the steamboat landing at Quincy, and a balance of $7,700 is available from former appropriations.

As a result of the survey Major Townsend recommends that the area opposite the Broadway sewer (indicated on the map) be dredged to a depth of 6 feet at low water, the estimated cost of the work being $4,500. No modification of the existing project is considered by him advisable, and, in his opinion, the balance available after the work above recommended is done should be reserved for redredging the bay when it has shoaled sufficiently to interfere with its utility as an ice harbor. The views of Major Townsend are concurred in by the division engineer, Lieut. Col. O. H. Ernst, Corps of Engineers, by the Board of Engineers for Rivers and Harbors, which has reviewed these reports under the provisions of sections 3 and 14 of the abovementioned act, and by me.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

PRELIMINARY EXAMINATION OF QUINCY HARBOR AND BAY, MISSISSIPPI RIVER, ILLINOIS.

UNITED STATES ENGINEER OFFICE,
Rock Island, Ill., July 14, 1902.

GENERAL: The river and harbor act of June 13, 1902, provides for a preliminary examination of Quincy Harbor and Bay, Illinois. Your letter of June 23, 1902, assigns this duty to me.

I inclose a map[b] showing the location of harbor and bay with reference to the Mississippi River. There have been many Government surveys of Quincy Harbor and Bay, some of which have been ordered by Congress. The first survey was made in 1878, and projects and estimates were submitted for both.

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[a] Not reprinted, printed in House Doc. No. 112, Fifty-eighth Congress, second session.

[b] Not printed.

The project for the harbor provided for the construction of dams to deepen the channel across the bar in front of the city. These dams were constructed under subsequent appropriations and subserved the purpose for which they were built. Appropriations have since been made to remove the portion of the bar remaining in front of the steamboat landing, and the dams on the west side of the river have been lengthened and enlarged and some dredging done. During the progress of the work 12 surveys of this harbor have been made, the last in 1901. There has been expended on the improvement $26,526, and there is available $8,450 from appropriations made prior to the act of June 13, 1902, which has been reserved for dredging in front of the steamboat landing whenever it shall be found necessary.

The plan for the bay proposed dredging to 6 feet at low water over an area of about 90 acres. The amount to be dredged was 680,000 cubic yards, and the estimated cost $170,000. Appropriations have been made and expended to the amount of $130,000. The work has been done at a much less cost per cubic yard than was expected, and the entire area has been dredged and some parts of it redredged. Harbor lines have been established, and there would appear to be no further work needed other than that of maintenance of the proper depth in the bay itself and at the entrance. There have been seven surveys of the bay made, the last in 1895.

The river and harbor act of June 13, 1902, appropriates $20,000 for the improvement of Quincy Bay and for removing the sand bar at the steamboat landing at Quincy, Ill.

Quincy Harbor and Bay are commercially important. Quincy has a population of about 37,000 and has as large a river trade as any city on the Mississippi River between St. Paul and St. Louis. The bay has a large sawmill and boat yard, and serves as winter quarters for many floating craft.

Complaints have been made that the channel in front of the steamboat landing has been filling considerably during the past season, and it is deemed probable that some deposit has occurred in Quincy Bay since 1895. It therefore seems desirable that a survey should be made to determine these questions and for the purpose of preparing a project for the expenditure of the funds available for the improvement. It is estimated that the cost of such a survey will not exceed $500, and the cost is properly chargeable to the improvement.

I would respectfully recommend that a new survey of Quincy Harbor and Bay be made for the purpose above mentioned, and that this survey be utilized to determine if any modification of the existing projects for the improvement of Quincy Harbor and Bay is advisable. No additional funds are requested.

Very respectfully, your obedient servant,

C. McD. Townsend,
Major, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,
Chicago, Ill., July 15, 1902.

Respectfully forwarded to the Chief of Engineers, recommended for approval.

O. H. ERNST,
Lieut. Col., Corps of Engineers,
Division Engineer, Northwest Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
July 23, 1902.

Respectfully submitted to the Secretary of War.

This is a report upon preliminary examination of Quincy Harbor and Bay, Illinois, required by the provisions of the river and harbor act of June 13, 1902.

Concurring in the views of the local officer, I recommend that a survey of the locality be made, and the cost of improvement be estimated for the purpose of securing information necessary for preparing a project for the expenditure of funds already available for improvement, and for determining whether any modification of the existing projects for improvement is required, the expense of the survey to be paid from the appropriation for improvement.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

WAR DEPARTMENT,
July 29, 1902.

Approved as recommended by the Acting Chief of Engineers.

WM. CARY SANGER,
Acting Secretary of War.

[Eighth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
January 7, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Ninth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington D. C., February 12, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the accompanying reports on the preliminary examination and survey of

Quincy Harbor and Bay, Illinois, and concurs in the recommendations of the district officer and the division engineer, namely: That no modification of the existing project is desirable, and that the necessary amount from available funds be expended in dredging the area opposite the Broadway sewer to a depth of 6 feet at low water, the balance of funds remaining to be reserved for such work as may be found necessary in the future.

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

SURVEY OF QUINCY HARBOR AND BAY, MISSISSIPPI RIVER, ILLINOIS.

UNITED STATES ENGINEER OFFICE,
Rock Island, Ill., December 19, 1902.

GENERAL: I have the honor to submit the following report upon a survey of Quincy Harbor and Bay made in compliance with section 14 of an act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes, approved June 13, 1902, as directed in your indorsement to my report of July 14, 1902, upon a preliminary examination. The results of the survey are shown on the accompanying map.

The original project for the improvement of Quincy Harbor and Bay, adopted in 1879, provided—

(*a*) For the construction of 3 spur dams and a closing dam, to deepen the channel across a bar in the river in front of the city of Quincy.

(*b*) For improving Quincy Bay for use as a winter harbor and for accommodation of commerce, by dredging an area of about 90 acres to a depth of 6 feet at low water.

The project was completed in 1895.

Appropriations have recently been made to remove the portion of the bar in front of the steamboat landing, and under these appropriations the dams on the Missouri side of the river have been lengthened and enlarged, and some dredging has been done.

The survey indicates that the area dredged has filled up and that there has also been considerable deposit in Quincy Bay, somewhat reducing the available width and depth between the two bridges. Above the upper bridge the deposit has been much greater. The bar in front of the steamboat landing at Quincy now extends to a point 350 feet below Main street, but is separated from the town by a channel having a width exceeding 250 feet from below to the steamboat landing, thence diminishing to a width of about 100 feet at the lower bridge. This reduction in width appears to be due principally to deposits from a sewer that discharges at the foot of Broadway.

A comparison with a survey of 1900 shows, besides the filling of the dredged area, a movement of the 4½-foot contour about 300 feet downstream, little change in the 6-foot contour, approximately the same width of channel to the steamboat landing, and some fill opposite the sewer.

There is available for removing the sand bar in front of the steamboat landing at Quincy a balance of $7,700 from appropriations made prior to the act of June 13, 1902, and an allotment for the improvement of Quincy Bay and removing the sand bar at the steamboat landing at Quincy, jointly, of $20,000, made by that act.

To divert the current of the Mississippi River, so as to cause it to remove the bar opposite the steamboat landing, would necessitate a further extension of the dams on the Missouri side of the river. If the river channel should be also maintained in the existing draw spans of the Chicago, Burlington and Quincy bridge across the river, this would introduce a sharp curve in the channel just below the bridge, difficult of navigation by steamboats and almost impracticable for rafts. If the diversion of the channel be commenced above the bridge, the draw span will require reconstruction so as to cover the new channel.

The benefits to navigation to be derived from such an expenditure are slight. There exists to the steamboat landing at present a width of channel greater than that which accommodates the 9,000,000 tons of commerce that annually enters and clears from the Chicago River, or that which is proposed for the Calumet River. A boat going downstream has at low stages to proceed perhaps 500 feet farther than it otherwise would before turning to land, and after landing has to back down a similar distance before it can conveniently turn to continue its journey.

The accretions in Quncy Bay have reduced the area available as an ice harbor from about 90 acres to about 37 acres, i. e., to the space inclosed by the harbor lines between the two railroad bridges. The sawmill that formerly used this harbor extensively for storing logs has recently burned, and probably will not be rebuilt. The space between the bridges appears to be ample for all the boats and barges that at present make use of this harbor, but it is considered probable that deposits from the sewer at the foot of Broadway will ultimately further obstruct the harbor entrance, and a gradual shoaling of the entire area is to be apprehended.

It is therefore recommended that the area opposite the Broadway sewer (marked on the map) be dredged to a depth of 6 feet at low water. The amount of material proposed to be dredged is about 30,000 cubic yards, and the estimated cost of the work is $4,500.

No modification of the existing project is considered advisable, and the balance available after the work recommended in the paragraph immediately preceding is done should be reserved for redredging the bay when it has shoaled sufficiently to interfere with its utility as an ice harbor, or to open a channel to the steamboat landing if the sand bar should close the existing channel—a contingency that is not considered probable for many years.

Very respectfully, your obedient servant,

C. McD. Townsend,
Major, Corps of Engineers.

Brig. Gen. G. L. Gillespie,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

Office Division Engineer, Northwest Division,
Chicago, Ill., December 22, 1902.

Respectfully forwarded to the Chief of Engineers, recommended for approval.

O. H. Ernst,
Lieut. Col., Corps of Engineers,
Division Engineer, Northwest Division.

Y II.

PRELIMINARY EXAMINATION OF ROCK RIVER, ILLINOIS, FROM ITS MOUTH TO ROCKFORD.

[Printed in House Doc. No. 169, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith a report, dated September 12, 1902, by Maj. C. McD. Townsend, Corps of Engineers, on preliminary examination of Rock River, Illinois, from the mouth to Rockford, made in compliance with a requirement in the river and harbor act of June 13, 1902. It is Major Townsend's opinion, concurred in by the division engineer, Lieut. Col. O. H. Ernst, Corps of Engineers, and by the Board of Engineers for Rivers and Harbors, which has reviewed this report under the provisions of sections 3 and 14 of the abovementioned act, that the improvement of this locality is not advisable.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF MAJ. C. M'D. TOWNSEND, CORPS OF ENGINEERS.

United States Engineer Office,
Rock Island, Ill., September 12, 1902.

General: I have the honor to submit the following report upon a preliminary examination of Rock River from the mouth to Rockford, Ill., made in pursuance of instructions contained in letter from the Office of Chief of Engineers, United States Army, dated June 23, 1902, and to comply with requirements of an item in section 14 of the act of Congress approved June 13, 1902.

The Rock River rises in southeastern Wisconsin and flows in a southwesterly direction, emptying into the Mississippi River about 2 miles below the city of Rock Island. In 1866, under direction of Lieut. Col. J. H. Wilson (now brigadier-general, U. S. Army, retired), a survey of the river was made for the purpose of determining its practicability as a portion of a channel of water communication between Lake Michigan and the Mississippi River. From this survey it is found that the distance from Rockford to the mouth of Rock River is about 142 miles, and the average river slope through this portion of the river about 1 foot per mile. It was demonstrated by General Wilson that Lake Horicon, the purported source of the Rock River, would feed the summit level of a canal extending from Lake Michigan to the Mississippi River, with locks 200 feet long, 30 feet wide, and a depth of 7 feet of water on miter sills. Recent gaugings of the river at Sterling, Ill., give a minimum discharge of 700 cubic feet per second.

General Wilson also reports that by a series of dams and occasional lateral canals slack-water navigation of 7-foot depth can be obtained the entire length of the river.

The construction of the Illinois and Mississippi Canal will, however, materially change the conditions. This canal will extend, when completed, from a point opposite the town of Hennepin, on the Illinois River, to the Mississippi River at the mouth of Rock River. It will have a depth of 7 feet and a minimum top width of 80 feet, and is to be supplied with water from Rock River by a feeder of similar dimensions that taps the river at Rockfalls, opposite Sterling.

It is not probable that the low-water discharge of Rock River at Sterling is sufficient to supply this canal and a second waterway of the same depth in the river bed; but as the feeder will be navigable, and with the Illinois and Mississippi Canal will afford a means of water communication to both the Mississippi and Illinois rivers, a slack-water improvement of the river itself below Sterling would be of little value. The distance from Sterling to the Mississippi River by the feeder and canal is approximately the same as that following the winding course of Rock River, and there are no towns on the river below Sterling of sufficient importance to justify any expenditure for its improvement. It is therefore evident that no survey from the mouth of the river to Sterling is needed.

Between Sterling and Rockford, about 63 miles, Rock River is susceptible of improvement, and at a cost, for a 7-foot waterway, estimated by General Wilson at $2,139,819.

The river flows through a rich farming country and has several thriving cities on its banks. The census report of 1900 gives the following statistics of the counties bordering the river between Sterling and Rockford:

Name of county.	Population, 1900.	Number of farms, 1900.	Acreage of farms, 1900.	Valuation of farm property, 1900.	Valuation of farm products, 1899.
Winnebago	47,845	2,245	315,761	$21,492,561	$2,889,087
Ogle	29,129	3,093	467,723	32,065,024	4,313,708
Lee	29,894	2,860	453,624	31,780,714	4,115,733
Whiteside	34,710	2,836	425,231	27,846,953	3,896,151
Total	141,578	11,034	1,662,339	113,185,252	15,214,679

The following is a report of the manufactures, etc., at the principal towns on this portion of the river for 1900:

Name of city.	Population.	Manufactories.	Wage-earners.	Cost of materials.	Value of products.
Rockford	31,051	450	6,620	$6,928,941	$12,586,116
Dixon	7,917	111	2,778	3,447,640	5,624,709
Rockfalls	2,176	31	448	581,826	1,087,775
Sterling	6,309	118	704	991,892	1,733,144
Total	47,453	710	10,550	11,950,299	21,031,744

There are numerous products, both agricultural and manufactured, in this region that require transportation, and, if they would use a water route, they are sufficient to justify its construction.

Numerous railroads traverse this portion of the State, and afford ample means of communication, but complaint is made that the freight rates charged are excessive and retard the development of the country. An extension of the Illinois and Mississippi Canal to Rockford is expected by its advocates to have a regulating effect upon these rates. The advisability of the improvement is therefore dependent upon its producing an appreciable reduction in the cost of transportation.

The maximum freight rates for railroads in Class A allowed by the railroad and warehouse commissioner of the State of Illinois for the distance between Rockford and Chicago, 87 miles, are as follows, per 100 pounds, Illinois classification:

	Cents.
Class 1	36.66
Class 2	30.08
Class 3	24.34
Class 4	17.86
Class 5	14.28
Class 6	11.98
Class 7	11.09
Class 8	8.46
Class 9	7.77
Class 10	6.09

The existing railroad competition has brought about some reduction from these rates in special cases, particularly in coarse freight carried in carload lots, but the published railroad Rockford-Chicago class rates are the same as those given above. The published rates between Chicago and Milwaukee, 85 miles by rail, but with water competition, are as follows:

Western classification.

	Class 1.	Class 2.	Class 3.	Class 4.	Class 5.	Class A.	Class B.	Class C.	Class D.	Class E.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
By rail	25	20	15	12	8	8½	7	6	5	4
By water	22½	18	13	11	7	7½	6	5½	4½	4

It is probable that if a line of water communication of approximately the same length could be established between Rockford and Chicago, similar rates would obtain; but the improvement of Rock River between Rockford and Chicago would not create a direct line of communication.

It would be necessary for a boat traveling from Chicago to Rockford to first traverse the Illinois and Michigan Canal to Lasalle, a distance of 102 miles; thence proceed in the Illinois River to Hennepin, about 16 miles; thence by the Illinois and Mississippi Canal to its junction with the feeder, 28 miles; by feeder 29 miles, and from Sterling to Rockford along Rock River, about 63 miles, a total of about 238 miles, and the proposed improvement of the Des Plaines and Illinois rivers in connection with the Chicago Drainage Canal would not materially shorten the distance. A water route 238 miles long would have to compete with a railroad 87 miles long, as shown on the accompanying map.[a]

The published rail and water rates for the nearest corresponding distance by lake, i. e., between Chicago and Sturgeon Bay, are as follows:

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[a] Not printed.

Western classification.

	Class 1.	Class 2	Class 3.	Class 4.	Class 5.	Class A.	Class B.	Class C.	Class D.	Class E.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
By rail	43	36	29	20	15	17.5	15	12.5	10	8
By water	35	28	23	18	15	17	15	13	11	10

Between St. Louis and Burlington, a distance by the Mississippi of 234 miles, the rail and river rates are:

	Class 1.	Class 2.	Class 3.	Class 4.	Class 5.	Class A.	Class B.	Class C.	Class D.	Class E.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
By rail	40	32	24	17	12	14	12	10	9	8
By river	30	25	20	15	10	10	9	8	7.5	7

It will be noted that in both these cases the rail rates exceed the existing published rates between Chicago and Rockford. The Sturgeon Bay-Chicago water rates are approximately equal to the Chicago-Rockford rail rates, but the St. Louis-Burlington water rates are materially less than the latter, except for low-grade freight.

Notwithstanding that the water rates are low when compared with the rail rates between St. Louis and Burlington, the movement of freight by water between these two points is insignificant. The terminal facilities, reliability of carrier, time of delivery, insurance rates, and other advantages that the railroads possess cause the great mass of traffic to seek the railroad, and the great benefit Burlington derives from being located on a navigable river is the resultant reduction of rail rates. These rail rates, however, are not as low as the existing Rockford-Chicago rates. The improvement of Rock River would not in my opinion have any material effect on the existing Rockford-Chicago freight rates.

Another important transportation route to be considered in connection with the improvement of Rock River is that from Rockford to St. Louis. The published rail rates between Rockford and East St. Louis, Illinois classification, are:

	Cents.
Class 1	47
Class 2	38
Class 3	29
Class 4	23
Class 5	18
Class 6	15
Class 7	14
Class 8	12
Class 9	10.9
Class 10	9

These rates are a marked reduction from the maximum rates allowed for that distance by the Illinois railroad and warehouse commissioners and are the same as the St. Louis-Dubuque railroad rates, which have the benefit of water competition along the Mississippi River. As the distance by river from Rockford to St. Louis exceeds that from

Dubuque to St. Louis, no further reduction in railroad rates in this direction is to be anticipated by the improvement of Rock River.

The Rockford-St. Paul rates correspond with the rail rates between St. Louis and St. Paul, and Rockford is now enjoying as great reductions in freight rates to the northern markets from the Mississippi River competition as if it were connected with the river. The railroads entering Chicago compete for the trade of river towns with those entering St. Louis, and Rockford incidentally obtains the benefits of such competition.

As regards markets west of the Mississippi River, it is probable that the cost of transferring from boat to car at Mississippi River points would be greater than the saving in transportation to those points by river over rail.

While this analysis of freight rates has been applied to Rockford, it is equally applicable to any of the cities on Rock River between Sterling and Rockford. The extention of navigation from the Illinois and Mississippi rivers to Rockford will not materially affect freight rates from the cities along Rock River to the principal markets for their products.

There would, however, be a local commerce along the line of the canal of some importance, particularly in coal, as the Illinois and Mississippi Canal traverses some of the coal fields of the State. It is estimated that about 70,000 tons of coal are annually consumed in the cities on Rock River, and a material reduction in the price of this coal to the consumer should result from water transportation. From Rockford to the Mendota coal fields is by rail about 80 miles, and the railroads are permitted by State laws to charge for that distance a maximum rate on coal of 96 cents per ton. From Rockford to the Illinois River coal mines the distance by Rock River and the Illinois and Mississippi Canal is about 125 miles, and barge navigation would be profitable at one-half that rate.

The amount, however, that the people of these cities would save annually on coal would not equal the annual cost of maintaining the improvement, which is estimated at about $1,000 per mile.

I have therefore to report that the improvement of Rock River from its mouth to Rockford is not deemed advisable.

Very respectfully, your obedient servant,

C. McD. TOWNSEND,
Major, *Corps of Engineers*.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, *U. S. A.*
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,
Chicago, Ill., *September 15, 1902.*

Respectfully forwarded to the Chief of Engineers.

I concur in the opinion, expressed in the last paragraph, that the improvement of Rock River from its mouth to Rockford is not advisable.

O. H. ERNST,
Lieut. Col., *Corps of Engineers*,
Division Engineer, *Northwestern Division.*

[Second indorsem

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 22, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., April 8, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given full consideration to the within report of the district officer and the indorsement of the division engineer thereon. An opportunity was given parties interested in the proposed improvement to present further arguments, but none were offered.

The report is very full and complete in all its details. For reasons clearly stated therein the district officer and the division engineer are of the opinion that it is not desirable for the United States to undertake the improvement of Rock River from the mouth to Rockford, Ill. In this opinion the Board concurs.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

APPENDIX Z.

RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER; IMPROVEMENT OF MISSISSIPPI RIVER FROM ST. PAUL TO MINNEAPOLIS, MINNESOTA; OF RIVERS IN WISCONSIN AND MINNESOTA TRIBUTARY TO MISSISSIPPI RIVER, OF WARROAD HARBOR AND RIVER, MINNESOTA, AND OF RED RIVER OF THE NORTH, MINNESOTA AND NORTH DAKOTA.

REPORT OF MAJ. G. McC. DERBY, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Mississippi River between St. Paul and Minneapolis, Minnesota.
2. Reservoirs at headwaters of Mississippi River, and Mississippi River between Brainerd and Grand Rapids, Minnesota.
3. Operating and care of reservoirs at headwaters of Mississippi River.
4. St. Croix River, Wisconsin and Minnesota.
5. Minnesota River, Minnesota.
6. Red River of the North, Minnesota and North Dakota.
7. Warroad Harbor and Warroad River, Minnesota.
8. Survey of Otter Tail Lake and Otter Tail River, Red Lake and Red Lake River, Minnesota, and Big Stone Lake and Lake Traverse, Minnesota and South Dakota.
9. Gauging Mississippi River at or near St. Paul, Minnesota.

United States Engineer Office,
St. Paul, Minn., July 16, 1904.

General: I have the honor to submit herewith report upon the works of river and harbor improvements in my charge for the fiscal year ending June 30, 1904.

Very respectfully, your obedient servant,

G. McC. Derby,
Major, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

Z 1.

IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN ST. PAUL AND MINNEAPOLIS, MINNESOTA.

The approved project will be found in the Report of the Chief of Engineers for 1904, Part 1, page 420.

The expenditures during the past fiscal year were $107,302.19.

The work during the year at Lock and Dam No. 2 consisted in the completion of the west 273 feet of the dam, including the two 50-foot sluiceways and the reversed Parker bear-trap sluice gates; the construction of cofferdams for the middle (last) section of the dam; pumping out the cofferdam inclosure, and commencement of excavation. At Lock and Dam No. 1 roads were constructed; the sites for track of traveling cable hoist were partly graded; cement warehouse, scales, and scale house were erected, and the construction of cofferdam for the lock was nearly completed.

The high stage of water in the river during the fall of 1903 and spring of 1904 has delayed the work at both locks and dams. The rise reached its crest in April and the large volume of water passing through the sluices at Lock and Dam No. 2 scoured the bed of the river both above and below. This necessitated riprapping at considerable expense in order to protect the work.

The bear-trap sluice gates in Dam No. 2 were tested under heads varying from 1¼ feet to 10¼ feet, and their operation was entirely satisfactory.

The upper gate at Lock No. 2 is a Chittenden drum weir. It was built with the expectation of also using it as a sluiceway for excess water and it was so used during the high water last spring. The tests of the gate in May and June showed excellent features as a lock gate, but as a sluice gate it was not entirely satisfactory. The conditions during the tests were not normal and therefore the trials for sluicing were not conclusive.

Details of work done will be found in the accompanying report of Mr. A. O. Powell, assistant engineer.

The present condition of negotiations for acquisition of flowage rights for both locks and dams will be found in the appended report of Mr. R. Davenport, assistant engineer.

Money statement.

July 1, 1903, balance unexpended	[a]$564, 341. 97
June 30, 1904, amount expended during fiscal year, for works of improvement	107, 302. 19
July 1, 1904, balance unexpended	457, 039. 78
July 1, 1904, outstanding liabilities	14, 226. 85
July 1, 1904, balance available	442, 812. 93
July 1, 1904, amount covered by uncompleted contracts	4, 670. 08
Amount (estimated) required for completion of existing project	([b])

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[a] This amount is $18.96 in excess of that given in the 1903 report, the difference being caused by corrections in amounts of Treasury settlements and error in transferring.

[b] The project is not completed, but Congress has not yet adopted the submitted estimate of the additional amount required to do the work, which is $299,543.

ABSTRACT OF APPROPRIATIONS.

By act approved—	
August 18, 1894	$51,000.00
July 13, 1892 (allotted by act of August 18, 1894)	49,877.67
By act of June 3, 1896	100,000.00
By act approved—	
March 3, 1899	150,000.00
June 6, 1900	185,000.00
March 3, 1901	157,000.00
June 28, 1902	250,000.00
March 3, 1903	223,579.33
Total	1,166,457.00

Abstract of contracts (emergency) in force.

Name.	Date.	For—	Unite price.	Date of beginning.	Date of expiration.
	1904.				
Rogers Lumber Co	Apr. 21	344,880 feet B. M. lumber	$6.90-$6.95	May 1	July 1.[a]
St. Paul Foundry Co	May 2	Grated covers and foot walks.	1,030	May 12	July 1.
Do	June 3	Maneuvering machinery	1,244	June 13	Aug. 2.

[a] Extended to July 31, 1904.

COMMERCIAL STATISTICS.

There has been no commerce over this section of the river during the year except that of drifting loose logs, of which there were about 136,000,000 feet B. M., or approximately 476,000 tons, the estimated value being $1,360,000. No other kind has been possible on account of the swift current and numerous rocks and bowlders.

REPORT OF MR. A. O. POWELL, ASSISTANT ENGINEER.

St. Paul, Minn., *July 11, 1904.*

Major: I have the honor to submit a report of operations upon the improvement of the Mississippi River between Minneapolis and St. Paul during the fiscal year ending June 30, 1904.

GENERAL.

The improvement contemplates the construction of two locks and dams numbered respectively 1 and 2. Legislation by Congress required that the upper lock and dam, No. 2, be built first. The construction scheme for No. 2 divided the site into three sections; the east section embraced the lock only; the west section included the two bear-trap sluices, each 50 feet wide, and 90 feet of the roll dam; the middle or last section to be built consists of 431 feet of roll dam.

CONDITION AT BEGINNING OF THE YEAR.

LOCK AND DAM NO. 2.

The east section, or lock, had been completed except installation of maneuvering machinery for lower lock gate and removal of cofferdam. The work in west section was nearly finished. Nothing was done toward the middle section.

LOCK AND DAM NO. 1.

The construction of the lock cofferdam and of a roadway down the side of the west bluff had been commenced about a month previous.

CONDITION AT END OF THE YEAR.

LOCK AND DAM NO. 2.

The east and west sections are complete except removal of lock cofferdam, installation of maneuvering machinery for lower lock gate and building of 7 feet in depth of cribwork on 90 feet of dam inclosed in the west section, which was purposely omitted to provide additional escape for water while the middle section is in process of construction. The closing cofferdams for middle section are built, the inclosure pumped out, and everything in readiness for a vigorous prosecution of the work.

LOCK AND DAM NO. 1.

Roads at east and west approaches to the lock and dam are built; grade for cableway tracks nearly finished; the lock cofferdam almost completed, and a few buildings erected.

OPERATIONS DURING PAST FISCAL YEAR.

The stage of water for the past twelve months has been unfavorable for rapid and economical construction work. High water entailed a loss of two months' time at Lock and Dam No. 2, and four months at No. 1.

LOCK NO. 2.

A portion of the cofferdam was removed and during the two freshets last spring water was allowed to flow through the lock. No ill results followed therefrom, but tests made of the upper lock gate (a Chittenden drum weir) in May and June indicated that the gate might not respond under all conditions when used as a sluice gate, but in its legitimate capacity as a lock gate it acted admirably. The tests for sluicing were not conclusive as the stage of back water was affected by cofferdams, but it was demonstrated that the gate would have been equally effective in either capacity if the inlets to the operating conduits had been placed at the upper ends of the piers instead of opposite the gate where the loss of head amounted to several feet.

An objection was developed to the use of the lock for the passage of flood water, except in cases of emergency, by a deposit of sand, gravel, and large stones over the filling valves. Should this occur again it might involve delay to traffic and an expense for cleaning filling valves or culverts.

DAM NO. 2.

The work on west section was completed last fall and the cofferdam removed. The two reversed Parker bear-trap gates were tried September 29, 1903, the head of water being 15 inches. The operation of the gates was gratifying; they raised and lowered quickly and gently. In May and June the gates were successfully manipulated under heads varying from 7 feet to 10 feet 3 inches. There is no reason to suppose that they will not be certain of action under the maximum head of 13 feet.

An excessive scour of the bed of the river above the sluices occurred during the high water in April, 1904. An eddy formed below the west sluice that for a time threatened serious consequences. The scour above the sluices extended to a depth of 11 feet and was unexpected. If it had been anticipated, provisions could have been made for its prevention. The eddy was stronger than was deemed probable. It and the scour above necessitated heavy riprapping, which was done under adverse circumstances.

The serious work of the year was the construction of the upper closing cofferdam for the middle section. As the construction proceeded a constantly increasing head was created until it reached a height sufficient to divert the entire river through the sluices at west end of dam. The winter time was selected for the work, as then the volume of the river is at a minimum and the consequent head of water on the cofferdam, the least, 5 feet. The plans for the cofferdam were matured before the work was begun, and executed without hindrance during the months of December, January, and February. The procedure followed was to drive 4 rows of round piles, 10 feet centers each way. Around and among the piles was built a brush and stone dam reaching above the water surface. Two rows of sheet piling, 10 feet apart, were then driven in the slack water above the brush and stone dam; the space between the piling was filled with pulverized sand rock, that being the only unfrozen material available, and covered with 3-inch plank at a height of 6 feet above the brush and stone dam. The cofferdam withstood the spring freshet of 1904 without damage. The maximum depth of water that flowed over the dam was about 2½ feet. The brush and stone dam acted as an apron, preventing scour. The construction of the lower closing cofferdam in the slack water formed by the upper closing cofferdam was a simple matter. It was not finished, however, when the spring rise took place, and about 75 feet of the sheet piling was washed away. The damage was easily repaired. It is probable that high water would have damaged the coffer even if it had been finished, as it was not designed to withstand the passage of a flood over it, because it was deemed cheaper to repair an injury from uncertain high water than to provide expensive protection. The stage of water receded by May 25 sufficiently to enable the middle-section cofferdam to be pumped out, but another rise followed before work was fairly started. The cofferdam was finally pumped the last of June, and the close of the year found the actual progress work on the middle section of dam just started.

LOCK AND DAM NO. 1.

The high water that was so detrimental to progressive work at Lock and Dam No. 2 was even more so at No. 1. The lock cofferdam, which should have been completed last fall, is now only nine-tenths finished and forced expensive filling during the winter time that could have been much better accomplished in mild weather. The loss of time is not a serious matter at No. 1, as only preliminary work has been contemplated until machinery can be moved from No. 2, and there is yet ample time to do this.

Besides the cofferdam, roads aggregating 1½ miles in length have been built at the approaches at both ends of the lock and dam. One of the roads was an expensive undertaking. It has a length of 800 feet, grade 8 per cent, located on the side of a precipitous bluff, and all in excavation, one-half limestone and one-half sand rock.

A cement shed 35 feet by 100 feet, scales and scale house 12 feet square, have been erected, also the frame for a storage shed 15 by 100 feet.

Grading for the tracks of the traveling cable hoist has been nearly finished.

A large quantity of lumber and iron have been purchased, received, sorted and piled.

EXPENDITURES.

The cash expenditures have been itemized in the following table:

Statement of expenditures from commencement of work to June 30, 1904.

LOCK AND DAM NO. 2.

Miscellaneous:		
Lands, surveys, borings, water supply, etc	$30,819.27	
Roads, ditches, and side track	5,041.43	
Lock tender's house	300.58	
Carpenter and blacksmith shop	1,588.68	
Cement warehouse	954.77	
Stone and sand bins	2,476.52	
Clearing Government land	856.70	
Booms	605.26	
Cleaning up	49.49	
Removing buildings and tube mill	409.65	
		$43,102.35
Plant:		
Cableway	17,899.93	
Air compressor	18,894.88	
Pumping outfit	4,436.60	
Crushing outfit	2,776.80	
Mixing outfit	1,360.46	
Tube mill	5,000.00	
Pile-driver barges	2,235.53	
Tracks and cars	4,484.29	
Tools	5,169.45	
		62,257.94
Lock No. 2:		
Cofferdam	21,355.30	
Stopping leaks	7,303.43	
Pumping	20,479.00	

Lock No. 2—Continued.		
Excavation	$17, 527. 49	
Cut-off walls	8, 009. 03	
Timber and iron	35, 406. 41	
Cement	36, 832. 67	
Silica cement (exclusive of cost of materials)	7, 776. 95	
Stone, granite	18, 148. 37	
Breaking stone	4, 603. 41	
Crushing stone	9, 978. 70	
Crushed sandstone	4, 864. 82	
Sand	7, 556. 47	
Mixing and placing concrete	23, 703. 05	
Concrete forms	15, 595. 63	
Removing concrete	422. 34	
Grouting foundation, upper lock gate	2, 997. 85	
Permanent subdrainage	4, 115. 68	
Snubbing posts	200. 00	
Filling back of land wall	6, 198. 93	
Upper lock gate	13, 770. 79	
Lower lock gate	18, 867. 12	
Filling valves	1, 511. 70	
Permanent coffers	1, 352. 72	
Guide piers	3, 003. 78	
Dredging	82. 71	
		$291, 664. 35
Dam No. 2:		
Cofferdams	23, 114. 43	
Upper closing cofferdam	9, 178. 22	
Pumping	17, 064. 59	
Excavation	15, 927. 98	
Leaks	1, 022. 13	
Cut-off walls	3, 717. 64	
Round piles	5, 709. 13	
Sheet piles	1, 532. 34	
Timber and iron	39, 852. 19	
Cement	19, 190. 62	
Silica cement (exclusive of materials)	1, 927. 30	
Stone	8, 303. 75	
Breaking stone	900. 56	
Crushing stone	3, 482. 80	
Sand	708. 58	
Mixing and placing concrete	10, 357. 86	
Concrete forms	5, 126. 30	
Sluice gates	23, 746. 21	
Filling dam and behind land wall	1, 852. 65	
Protection against high water during construction	4, 882. 03	
		197, 597. 31

LOCK AND DAM NO. 1.

Miscellaneous:		
Lands, surveys, borings, water supply, etc	15, 380. 58	
Roads, ditches, etc	10, 776. 68	
Buildings	3, 006. 89	
Clearing Government land	1, 085. 31	
		30, 249. 46
Plant:		
Cableway	1, 110. 10	
Tools	148. 43	
		1, 258. 53
Lock No. 1:		
Cofferdam	16, 060. 22	
Timber and iron	10, 678. 35	
		26, 738. 57

SUPERINTENDENCE AND CONTINGENCIES.

St. Paul office	$39, 242. 35	
Office Chief of Engineers	480. 00	
Office Division Engineer	252. 50	
Inspection	6, 505. 76	
Watching	8, 174. 22	
Care of dredge	506. 70	
Models for Louisiana Purchase Exposition	1, 387. 18	
		$56, 548. 71
		709, 417. 22

Respectfully submitted.

A. O. POWELL, *Assistant Engineer.*

Maj. GEO. McC. DERBY,
Corps of Engineers.

REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

ST. PAUL, MINN., *June 30, 1904.*

MAJOR: I have the honor to submit the following report as to the present status of the acquisition by the United States of title or right of flowage on lands to be affected by the construction of locks and dams on the Mississippi River between Minneapolis and St. Paul.

At the end of the previous fiscal year, June 30, 1903, owing to complications respecting the ownership of the lands, or from the refusal of the owners to accept reasonable compensation therefor, there remained unacquired by the United States the right of flowage on 6 tracts of land, containing 13.14 acres, within the flowage limits of Lock and Dam No. 1, and on one tract of land containing 0.102 of an acre, within the flowage limits of Lock and Dam No. 2; and in accordance with instructions from the Department at Washington, the United States attorney for the district of Minnesota had been supplied with the necessary maps and data for the inauguration of condemnation proceedings.

But since the date above mentioned, and before the said proceedings were commenced, the city of Minneapolis, for park purposes, having cleared the title and acquired control of a portion of lands in question, negotiations have been opened and are now pending with the board of park commissioners of the said city, for the relinquishment to the United States of flowage rights on three of the tracts of land above mentioned, containing 5.77 acres, within the flowage limits of Lock and Dam No. 1.

The condemnation proceedings for the acquisition by the United States of flowage rights or title on the four remaining tracts of land, containing 7.414 acres, are now stated by the United States attorney to be in preparation for immediate action.

Very respectfully, your obedient servant,

R. DAVENPORT, *Assistant Engineer.*

Maj. GEO. McC. DERBY, *Corps of Engineers.*

Z 2.

CONSTRUCTION OF RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER AND IMPROVEMENT OF MISSISSIPPI RIVER BETWEEN BRAINERD AND GRAND RAPIDS, MINNESOTA.

The approved project and report of progress of the work up to June 30, 1903, will be found in the Report of the Chief of Engineers for 1904, Part 1, page 422.

The expenditures during the fiscal year were $84,279.24.

During the year the work of reconstruction of Pokegama Falls dam was practically completed and the reservoir placed in operation May 29. The only remaining work is the dismantling and storing of the plant ready for transfer to Pine River reservoir, trimming the banks below the dam and generally cleaning up around the work. It will be necessary, however, to erect new quarters for the dam tenders, the present house being old and not likely to last long. Details of work done are shown in the accompanying report of Mr. Thomas Robinson, assistant engineer.

The field work of Leech Lake reservoir survey was completed and mapped, as was also the survey of Lake Winnibigoshish reservoir. Sandy Lake reservoir was resurveyed and the work of mapping almost completed. At intervals the preparation of lists of lands affected by flowage from the reservoirs was continued. Attention is invited to the accompanying report of Mr. R. Davenport, assistant engineer.

Work on the dikes and the reconstruction of the dam at Pine River reservoir was suspended under the terms of the act of June 13, 1902, and has not been resumed on account of the insufficiency of the available funds. I concur in the opinion expressed by my predecessor in his annual report to the Chief of Engineers for 1903, to the effect that the completion of the dikes and the renewal of the dam should be undertaken forthwith, the Pine River dam being now in a very rotten condition and not safe for a full head of water.

IMPROVING MISSISSIPPI RIVER BETWEEN BRAINERD AND GRAND RAPIDS, MINN.

During the year the river was worked over between Grand Rapids and Aitkin, Minn. While the river was open snagging and the removal of obstructions in the channel were carried on, and during the winter the brush and overhanging trees along the bank were cut and removed. Provision should be made for the continuation of this work. The adjacent territory is rapidly settling up and the railroad facilities are quite inadequate, so that steamboat traffic should increase if the river is kept in order. Details will be found in the accompanying report of Mr. Thomas Robinson, assistant engineer.

On the completion of the renewal of Pine River dam, which will probably be in 1906, Sandy Lake dam should be renewed. The present structure is in fair condition now, but the timbers are rapidly decaying. It is estimated that it will cost $175,000 to rebuild it with a navigable lock, as at present, or $125,000 without the lock feature.

Provision should also be made for the completion of the dikes at Pine River reservoir.

Total expenditure from appropriation for construction of reservoirs since July 1, 1898, when the cadastral surveys and the renewal of the old dams were begun.

Contingencies:		
Main office	$21,030.75	
Inspection	1,969.39	
Road between Lake Winnibigoshish and Leech Lake dams	684.53	
Examination of Long Prairie River	32.42	
Examination of Willow River	52.83	
		$23,769.92

Surveys:		
Plant	$4,265.82	
Pine River reservoir	2,886.67	
Pokegama Falls reservoir	9,428.38	
Leech Lake reservoir	27,849.10	
Lake Winnibigoshish reservoir	33,275.09	
Sandy Lake reservoir	6,048.71	
At Aitkin	877.94	
Below Pokegama	714.97	
		$85,346.68
Lands, easements, etc.:		
Below Pokegama	1,988.94	
Above Pokegama	8,786.36	
		10,775.30
Pine River reservoir:		
Dikes 1, 3, 4, and 14	9,070.24	
Damage caused by crevasse June 17, 1896	1,733.00	
		10,803.24
Pokegama Falls reservoir, booms		1,526.83
Reconstruction of Lake Winnibigoshish dam:		
Minor buildings	2,993.69	
Plant	9,198.39	
Cofferdam	16,301.40	
Embankments	10,380.42	
Repairs to old foundations	23,213.29	
Concrete	47,701.70	
Cement house	2,311.22	
Log sluice gate	11,366.75	
Tainter gates	15,751.53	
Piers and booms above dam and embankment	5,029.41	
		144,247.80
Reconstruction of Leech Lake dam:		
Repairs to buildings	1,333.50	
Miscellaneous	3,148.00	
Plant	7,362.08	
Cofferdams	13,080.19	
Removal of old dam	2,013.05	
Repairs to old foundation	14,605.98	
Concrete	21,655.54	
Stop plank and hoisting gear	2,352.75	
Embankments	4,003.40	
Bridge over dam	573.38	
		70,127.87
Reconstruction of Pokegama Falls dam:		
Excavation	1,707.54	
Embankments	1,412.41	
Cofferdam	10,646.27	
Steel work, gates, etc	25,140.31	
Plant	5,388.56	
Concrete	33,725.24	
Removal of old dam	7,173.30	
Repairs and alterations to buildings	3,887.14	
Repairs to old foundations	851.33	
Fishway	85.58	
Miscellaneous	1,669.17	
		91,686.85
Improving Mississippi River between Brainerd and Grand Rapids:		
Plant	419.37	
Removal of obstructions	5,256.29	
Inspection	144.23	
Main office	88.94	
		5,908.83
Total		444,193.32

Estimate for the completion of the work contemplated in the river and harbor acts approved March 3, 1899, and June 13, 1902.

Completion of Pokegama Falls dam	$5,000
Renewal of Pine River dam	125,000
Renewal of Sandy Lake dam	175,000
Construction of dikes, Pine River reservoir	30,000
Purchase of lands or easements	75,000
Improving Mississippi River between Brainerd and Grand Rapids, Minn. (two years)	20,000
Contingencies	40,000
	470,000
Balance unexpended July 1, 1904	80,000
Amount required	390,000

Money statement.

July 1, 1903, balance unexpended	[a]$164,342.54
Proceeds of sale of abandoned building	15.25
	164,357.79
June 30, 1904, amount expended during fiscal year, for works of improvement	84,279.24
July 1, 1904, balance unexpended	80,078.55
July 1, 1904, outstanding liabilities	3,087.48
July 1, 1904, balance available	76,991.07
Amount (estimated) required for completion of existing project	[b]390,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for works of improvement, in addition to the balance unexpended July 1, 1904	200,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act—		By act—	
Approved June 14, 1880	$75,000	Approved July 13, 1892	$60,000
Approved March 3, 1881	150,000	Of August 18, 1894	51,000
Passed August 2, 1882	300,000	Passed June 3, 1896	80,000
Approved July 5, 1884	60,000	Approved March 3, 1899	210,000
Approved August 5, 1886	37,500	Approved June 13, 1902	250,000
Of August 11, 1888	12,000		
Approved September 19, 1890	80,000	Total	1,365,500

COMMERCIAL STATISTICS.

[Mississippi River between Brainerd and Grand Rapids.]

Steamer *Irene* made regular trips during the season of 1903 between Grand Rapids and Aitkin, with an occasional trip to Brainerd. It carried about 2,225 tons general merchandise, valued at $101,750, and about 1,200 passengers between local points.

About 430,000,000 feet B. M. of logs were floated down the river. The weight of these logs was about 1,505,000 tons and their value about $4,000,000.

In addition to loose logs, rafts of logs, railroad ties, cedar poles, and posts were floated down, but the actual quantities could not be obtained.

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[a] This amount is $174.49 in excess of that given in the 1903 report, the additional amount being the balance of an old appropriation, $153.53, by mistake not carried forward, and a deposit of $13.75 not previously credited and refundments of $22.81, less $15.60 for Treasury settlements not previously charged.

[b] Work contemplated in river and harbor acts approved March 3, 1899, and June 13, 1902.

REPORT OF MR. THOMAS ROBINSON, ASSISTANT ENGINEER.

Pokegama Falls Dam,
Grand Rapids, Minn., July 3, 1904.

Major: I have the honor to submit report on reconstruction of Pokegama Falls reservoir dam and improvement of Mississippi River between Brainerd and Grand Rapids, Minn., for fiscal year ending June 30, 1904:

RECONSTRUCTION OF POKEGAMA FALLS DAM.

At the opening of the year the work was ready for building piers, and by the close of September all the concrete work of the northern half of the dam was done and the cofferdam removed. A cofferdam was then built around the southern half of the work, the floor of the old dam was repaired, forms were set up and concrete placed. By the close of November the building of the channel piers was completed and the masonry work was suspended for the winter. During the cold months, by the use of shelter sheds and stoves, the log sluice gate was built; the Tainter gates with their hoisting gears were put in place; the footbridge was laid across the dam, and four boom piers and three booms were built. In May, 1904, the concrete work was completed by the erection of the south abutment pier and wing wall. The cofferdam was removed, the lumber of the forms, scaffolding, and working bridge was cleared away; the wings of the dam and the river banks in connection therewith were graded and their surfaces covered with riprap up to the flowage line, and sodded or sown with grass seed above that level; the plant was dismantled and stored and the grounds partly cleared up.

At the close of the fiscal year the erection of stop-plank hoist and carrier, painting of the steel work of the dam, and some clearing up remained to be done.

DESCRIPTION OF THE DAM.

The new dam is built of concrete—in proportions, volumes loose, 1 of cement, 3 of sand, and 6 of stone—on the site of the old timber crib and stone structure, whose floor (elevation 1,265.27 feet above sea level) was repaired and excavated for the purpose.

The dam is 247 feet long from outside to outside of abutments. It has twelve 8-foot sluices, one 12-foot log sluice, and one 8-foot fishway. The abutment piers are 54 feet long and 11 feet thick in the middle. The two log sluice piers are each 72 feet long, but one is 10 feet and the other is 11 feet thick, this extra thickness being necessary to compensate the loss in bulk of masonry due to space occupied by the valve flumes. The other eleven piers are each 34 feet long and 8 feet thick. The tops of all piers are level and 14 feet above the floor of the dam.

The log sluice is closed by a reversed Parker bear-trap gate, built of Oregon fir, with steel hinges and fastenings. The gate has a total rise of 12.75 feet. The least head of water under which the gate was tried was about six-tenths of a foot, and with this it worked smoothly and quickly. The minimum head required to raise the gate to its full height is not known, but under a head of 4.5 feet it rises from lowest to highest point in fifty-one seconds, and it falls the same distance in forty-two seconds without jar or jerk. For the purpose for which this gate was designed it can not be bettered.

The 8-foot sluices are closed by Tainter gates having steel frames and oak-plank facings, and are manipulated by screw-geared winding spools and chains. No counterpoises are employed, and so the handling of the gates is necessarily slow.

Stop logs are used for closing all sluices during the winter, when, on account of ice, the regular gates can not be operated. For the placing of the stop logs and their transportation to and from the shore an elevated trolley way with tackle hoists is provided.

The wings of the dam have the old rock-ballasted cribs for cores, and are backed above and below with earthwork embankments whose surfaces are riprapped and sodded to prevent erosion.

Above the dam are five timber crib piers, ballasted with stone, connected together and with the log sluice of the dam with suitable booms for the control of logs and other floating bodies.

The dam, in its general features, excepting the gate-hoisting appliances, so closely resembles that at Lake Winnibigoshish (whose description was fully given in Report of the Chief of Engineers for 1901) that a more detailed description is now considered unnecessary.

Details of the chief items of cost.

Concrete, 3,382 cubic yards, at $9.972	$33,725.24
Cement, 3,775 barrels, at $2.408	9,089.79
Sand, 1,626.33 cubic yards, at $1.596	2,595.84
Rock (bought), 1,936.68 tons, at $1.102	2,134.34
Rock (collected), 1,135 tons, at $1.193	1,354.88
Rock breaking and crushing, 3,650 cubic yards, at $1.734	6,332.00
Forms, materials, and labor, per yard, $1.40	4,764.21
Mixing and placing	7,454.18
	33,725.24

Steel work, gates, etc.:		
1 bear trap, hinges, plates, etc	$5,021.97	
lumber	128.88	
valve	88.60	
labor, fuel, etc	3,204.90	
		8,544.35
12 Tainter gates, plates, etc	11,689.00	
hoisting machinery, etc	835.70	
labor, fuel, etc	3,935.10	
		16,459.80
Footbridge, materials only		136.16
Total		25,140.31

Remarks on wetness of concrete and temperatures of air when placed.

The cement was Portland "Universal" brand. The mixture was made wet, about the consistency of mortar as used by the ordinary mason.

Where the asterisk (*) appears in the following table the mixing water was heated.

Beginning at the north end of the dam, the abutment pier, small pier No. 1, the log sluice foundation, and north log sluice pier were all built in July, 1903, at an average temperature of 62° F.

The south log sluice pier and small piers Nos. 2 and 3 were placed in August, 1903, at an average temperature of 59½° F.

	When built.	Average temperature.
		° *F.*
Small pier No. 4	October, 1903	37
Small pier No. 5	do	44
Small pier No. 6	do	43
Small pier No. 7	do	51
Small pier No. 8	do	42
Small pier No. 9 *	November, 1903	46
Small pier No. 10 *	do	28
Small pier No. 11 *	do	39
South abutment pier *	May 2-10, 1904	51

Mississippi River between Brainerd and Grand Rapids, Minn.

The river and harbor act approved June 13, 1902, making appropriation for reservoirs at headwaters of Mississippi River, etc., provided that $10,000 might be expended for the improvement of the Mississippi River between Brainerd and Grand Rapids, Minn.

Under that provision a project was adopted for clearing the river of overhanging trees, stumps, and snags. In October, 1903, by utilizing barges, hoisting engine, and other appliances on hand, a small plant was fitted up and a crew was started at Grand Rapids to work downstream. Operations were carried on by boat until November 18, when stopped by freezing river. Methods were then changed, and for the balance of the winter season the crew lived in tents and worked along the river banks as far as Aitkin. In April, on account of thawing weather and high river, the work was suspended. On June 7 operations by boat were resumed and are in progress at the close of the fiscal year.

WORK DONE.

In the prosecution of the work thus outlined about 165 miles of river were worked over and 22,454 overhanging trees, 13,062 bushes, 547 stumps and snags, and 3,904 saw logs were removed. This removal of logs was not a primary part of the project, for floating logs are considered a form of navigation; but unrafted as the timber is, large numbers of the logs accumulate around the snags, and they must be removed before the real obstructions can be reached.

CONDITION OF IMPROVEMENT.

There is now a fair channel between Sandy Lake and Grand Rapids. Below Sandy Lake the overhanging timber alone has been removed. To make the channel, with a minimum flow of water, better suited to navigation needs, a few wing dams are wanted in wide portions of the stream, and three cut-offs should be either blocked or fully opened to the current. Neither of these came within the present project, and so no detailed examination was made for either wing dams or cut-offs.

DEPTH OF CHANNEL NEEDED.

The steamer at present using the river draws 3 feet with a full load, and many of the logs will ground in 2½ feet of water; so a channel of at least 3 feet depth should be aimed for.

COMMERCIAL STATISTICS.

The steamer *Irene*, running to river points between Aitkin and Grand Rapids, with an occasional trip down to Brainerd, carried during the past fiscal year 2,225 tons of general merchandise valued at $101,750, and about 1,200 passengers.

In addition to what the boat carried, I am informed that there were rafted to Aitkin from up-river points some 3,000,000 feet B. M. of logs to be manufactured into lumber, barrel staves, hoops, and head lining. The value of such logs would be about $30,000. There were also rafted to Aitkin railroad ties, cedar poles and posts, taken from the river there and loaded onto cars for shipment; but for these no figures could be secured.

Besides this the following approximate quantities of timber have been drifted down the river during the year:

	Feet B. M.
Logs passed Pokegama Falls dam	120,000,000
Logs from Prairie River	175,000,000
Logs from Swan River Landing and drives	85,000,000
Logs from Willow River	25,000,000
Logs from Sandy Lake, etc	10,000,000
Logs from various landings along river	15,000,000
Total	430,000,000

The approximate weight of these logs was about 1,505,000 tons, and their value about $4,000,000.

PROBABILITIES OF RIVER BUSINESS.

The lumber interests upon the stream will remain as large as at present for some years. Above Grand Rapids those interests will increase. As the timber is removed, agricultural business will grow. The country, owing to its large areas of low and swamp lands, is difficult for road building, and the river will become more and more an artery for commerce.

ESTIMATE OF FURTHER COST.

To complete the work according to project from Aitkin to Brainerd, and to build some wing dams and improve the cut-offs, I estimate that a further expenditure of $10,000 will be needed for the fiscal year ending June 30, 1905.

Very respectfully, your obedient servant,

THOMAS ROBINSON,
Assistant Engineer.

Maj. GEO. MCC. DERBY,
Corps of Engineers.

REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

St. Paul, Minn., *June 30, 1904.*

Major: The following report of operations in connection with the lands affected by reservoir flowage at the headwaters of the Mississippi River during the fiscal year ending June 30, 1904, is respectfully submitted:

The examination as to the ownership of the lands affected by flowage from Leech Lake, Lake Winnibigoshish, Pokegama Falls, and Sandy Lake reservoirs was suspended prior to the beginning of the fiscal year awaiting the completion of the surveys and maps. The maps are now completed, except those of Sandy Lake reservoir, which are expected to be finished by the 1st of August.

With Pine River reservoir—of which the survey and maps were completed prior to June 30, 1903, and of which 5 township maps have been prepared—and Sandy Lake reservoir, with 8 township maps in course of preparation, the entire area overflowed or affected by the reservoirs at headwaters of the Mississippi River is included in 68 township maps on a scale of 800 feet to 1 inch. Forty-three of these maps were practically completed during the past fiscal year. For convenience in further investigation as to ownership of the lands, areas affected, etc., photographic reductions to about one-half of the original scale have been made of all of the completed township maps. A general map of the areas affected by the flowage from Leech Lake, Lake Winnibigoshish, and Pokegama reservoirs, on a scale of 8,000 feet to 1 inch, has also been prepared.

The investigation as to land affected by reservoir flowage, on which the United States has not yet obtained title or easement, has been confined this year to lands within the Pine River reservoir flowage limits. Abstracts of title for 202 tracts of land affected by the flowage of this reservoir have been obtained and are now being examined to determine the present ownership, with the view of the acquisition by the United States of the necessary flowage right or title to the same.

For reports relating to the reservoir surveys, areas affected, general ownership of the land, etc., see Reports of the Chief of Engineers for 1902, pages 1674–1675, and 1903, pages 1537–1538.

Very respectfully, your obedient servant,

R. Davenport,
Assistant Engineer.

Maj. Geo. McC. Derby,
Corps of Engineers.

Z 3.

OPERATING AND CARE OF RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER.

The approved project and report of progress of the work up to June 30, 1903, will be found in the Report of the Chief of Engineers for 1904, Part 1, page 424.

Lake Winnibigoshish, Leech Lake, Pine River and Sandy Lake reservoirs were in operation during the entire year, and Pokegama Falls reservoir since May 29, 1904, when the work of reconstruction was sufficiently advanced to permit its use.

The effect of the reservoir system is to increase the stage of water in the Mississippi River at St. Paul during the low-water period, in late summer and fall, by 12 to 18 inches.

During the year minor repairs were made to the telephone line between Lake Winnibigoshish and Leech Lake dams, also to that between Sandy Lake dam and McGregor, Minn.

The new house for dam tenders at Leech Lake dam was practically completed, the only remaining work being the installation of water supply.

A new gauging station had to be provided to measure the discharge from Pokegama Falls dam. A suitable site was selected just below the last-named dam, but the bed of the river was so obstructed by bowlders and rock ledges that the gaugings were not considered sufficiently accurate. During the year the bed of the river at that point was smoothed off by the removal of bowlders and rock ledges and filling in depressions. Attention is invited to report of Mr. Thomas Robinson, assistant engineer.

Expenditures, exclusive of outstanding liabilities, to June 30, 1904	$181,162.94
Amount expended during fiscal year ending June 30, 1904, exclusive of outstanding liabilities	12,658.35

Distribution of liabilities incurred during fiscal years 1898–1904.

	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Pokegama Falls dam:							
Operating	$1,697.42	$1,704.08	$1,804.23	$1,704.85	$1,640.28	$887.79	$320.82
Repairs	144.62	....	337.45	....	....	....	....
Land condemnation	207.40	....	....	....	....	....	....
New gauging station	....	....	....	....	....	....	736.01
Total	2,049.44	1,704.08	2,141.68	1,704.85	1,640.28	887.79	1,056.83
Leech Lake dam:							
Operating	1,251.02	1,154.45	1,364.11	875.20	1,275.68	909.65	1,443.34
Repairs	163.95	....	....	....	9.45	....	35.56
Buildings	....	....	....	....	....	3,000.00	212.89
Total	1,414.97	1,154.45	1,364.11	875.20	1,285.13	3,909.65	1,691.79
Lake Winnibigoshish dam:							
Operating	1,734.67	966.10	435.72	722.42	803.33	1,622.25	1,687.69
Repairs	158.41	....	[a]5,384.12	[b]3,517.70	[c]2,088.31	....	[d]443.43
Buildings and grounds	....	....	....	1,587.37	640.74	....	59.54
Total	1,893.08	966.10	5,819.84	5,827.49	3,532.38	1,622.25	2,190.66
Pine River dam:							
Operating	1,770.41	1,235.28	1,252.00	1,269.75	1,164.92	930.00	960.00
Repairs	368.05	188.99	....	....	....	....	6.85
Crevasse	1,329.72	....	....	....	....	....	....
Total	3,468.18	1,424.27	1,252.00	1,269.75	1,164.92	930.00	966.85
Sandy Lake dam:							
Operating	2,430.44	1,745.91	1,581.02	1,535.44	1,634.12	1,408.78	1,380.25
Repairs	671.92	[e]999.15	....	....	307.27	....	5.37
Total	3,102.36	2,745.06	1,581.02	1,535.44	1,941.39	1,408.78	1,385.62
Superintendence, contingencies, and St. Paul office	3,184.17	1,747.75	3,348.40	3,514.62	3,458.25	2,519.66	3,268.97
Operating steamboat General Poe	1,692.22	....	....	....	....	....	....
Hydrological expenses	1,109.99	[f]100.00	[f]120.00	....	....	....	....
Operating expenses applicable to all reservoirs	1,166.38	2,539.15	1,069.99	2,187.04	1,477.65	1,024.05	719.28
Road between Leech Lake and Lake Winnibigoshish	407.01	1,719.16	2,652.96	1,583.73	....	....	....
Grand total	19,487.80	14,100.02	19,350.00	18,498.12	14,500.00	12,302.18	11,280.00

[a] Repairing dike.
[b] Repairing dike, $3,117.70.
[c] Repairing dike, $1,078.57.
[d] Bank protection below log sluice.
[e] Telephone line.
[f] Gauge readings at Deer River.

For commercial statistics reference must be made to the reports upon the improvement of the Mississippi River.

Summary of expenditures during the fiscal year ending June 30, 1904.

Services	$8,330.90
Supplies	452.39
Materials	605.83
Traveling expenses	292.11
Office expenses and contingencies	2,977.12
Total	12,658.35

Money statement.

July 1, 1903, balance unexpended	[a]$10,680.70
Refundments of overpayments	7.40
Amount allotted July 23, 1903	12,182.18
	22,870.28
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	12,658.35
July 1, 1904, balance unexpended	10,211.93
July 1, 1904, outstanding liabilities	751.93
July 1, 1904, balance available	9,460.00

Abstract of total liabilities incurred in each fiscal year.

During fiscal year ending June 30—		During fiscal year ending June 30—	
1895	$6,416.19	1902	$14,500.00
1896	30,800.15	1903	12,302.18
1897	35,180.41	1904	11,280.00
1898	19,487.80	Amount available June 30, 1904	9,460.00
1899	14,100.02		
1900	19,350.00		
1901	18,498.12	Total	191,374.87

ABSTRACT OF ALLOTMENTS.

January 25, 1895	$17,590.00	August 15, 1899	$12,720.02
June 15, 1895	18,852.91	July 16, 1900	20,610.00
June 20, 1896	5,000.00	September 28, 1900	7,000.00
July 24, 1896	23,471.98	August 12, 1901	12,948.12
For repairs to Pine River reservoir	7,481.86	July 16, 1902	13,300.00
August 4, 1897	23,870.00	July 23, 1903	12,182.18
August 4, 1898	16,347.80	Total	191,374.87

REPORT OF MR. THOMAS ROBINSON, ASSISTANT ENGINEER.

GRAND RAPIDS, MINN., *July 1, 1904.*

MAJOR: I have the honor to submit report on operating and care of reservoirs at headwaters of Mississippi River during fiscal year ending June 30, 1904.

Lake Winnibigoshish dam.—This reservoir was in full operation during the year. Some repairs were made to the bank protection below the dam; to the telephone line, etc.

Leech Lake dam.—The reservoir was in full operation throughout the year. The dam tender's house was completed, with the exception of water supply, and a fence was built.

Pokegama Falls dam.—Gauge readings and records were made throughout the year, but the reservoir was not put into full operation until May 29. A pier for holding gauge was built in Pokegama Lake, and a gauging station was made in the river between the dam and the crest of the falls. For this the river bed was cleared of bowlders and pinnacles of rock ledge; deep hollows were filled with loose rock and concrete was put into the shallow depressions; both banks were sloped; concrete piers for gauge. A-frame foundations and anchor blocks were built, and a cableway erected. To steady the flow of the stream below the station, a wing dam, made of the excavated bowlders, was built on each side of river.

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[a] This amount is 26 cents in excess of that given in the 1903 report, the additional amount being refundment of 25 cents in 1900 not previously credited, and an error of 1 cent in amount of a Treasury settlement.

Amounts of work done.

Ice removed from site of gauging station	square yards	3,400
Logs removed from site of gauging station		867
Bowlders, etc., removed	cubic yards	259
Bowlders and small rock placed in hollows	do	85
Bowlders and small rock placed on slopes and wings	do	206
Concrete in piers, foundations, and hollows	do	39

During the year 120,000,000 feet B.M. of logs and 4 barges have passed through the sluices of the dam.

Pine River dam.—This reservoir was in full operation during the year.

Sandy Lake dam.—The reservoir was in full operation during the year. Necessary repairs were made to the telephone line between the dam and McGregor, Minn.

Very respectfully, your obedient servant,

Thomas Robinson,
Assistant Engineer.

Maj. Geo. McC. Derby,
Corps of Engineers.

Z 4.

IMPROVEMENT OF ST. CROIX RIVER, WISCONSIN AND MINNESOTA.

The approved project and report of progress of the work up to June 30, 1903, will be found in the Report of the Chief of Engineers for 1904, Part 1, page 425.

During the past fiscal year there has been expended the sum of $54.53.

Owing to the limited amount of funds available, no work was done during the fiscal year. The expenditures were on account of transportation liabilities incurred during the preceding fiscal year, and advertising regulations. The river channel and the working plant have been deteriorating because of insufficient appropriations, and, as stated in the last annual report, increased appropriations are needed. The economical use of the existing plant in the work of maintenance on the St. Croix River requires an average annual expenditure of $3,600.

The controversy which commenced in 1897 between the logging and the steamboat interests is still continued. During the season of 1903 the flow of the water and the running of logs were so controlled by the lumber men that the operation of steamboats between Taylors Falls and Stillwater, Minn., was not practicable. There are four steamboats engaged in passenger excursion business at Stillwater, but there are thirty engaged in handling loose logs and rafting them to points below. The handling of over a million tons of logs, lumber, and other freight on this small stream results in its channel being so overcrowded that all its business can not be transacted with safety unless regulated by the Government. Regulations to govern the use of the river during the season of 1904, satisfactory to both sides of the controversy, were approved by the Secretary of War April 5, 1904, as follows:

In pursuance of the authority conferred by the act of Congress, approved May 9, 1900, entitled "An act authorizing the Secretary of War to make regulations governing the running of loose logs, steamboats, and rafts on certain rivers and streams," the following regulations are prescribed for the St. Croix River above Lake St. Croix, Wisconsin and Minnesota, a navigable waterway of the United States, whereon the floating of loose timber and logs and sack rafts of timber and logs is the principal method of navigation.

REGULATIONS.

1. During the season of navigation, from May 15 to August 31, the full natural run of water in the river shall be permitted to flow between 1 a. m. on Thursday and 4 p. m. on Sunday of each week, and during the time between 1 p. m. on Wednesday and 4 p. m. on Sunday of each week no logs shall be sluiced out of the Nevers dam.

2. Except during the period above mentioned, the parties engaged in handling logs upon the river shall have the right to sluice, drive, and float loose logs and to regulate the flow of water in the river as may best suit their convenience, all reasonable precaution being taken to avoid log jams.

3. These regulations shall remain in force until modified or rescinded.

Robert Shaw Oliver,
Assistant Secretary of War.

War Department, *April 5, 1904.*

Attention is invited to the report of Mr. R. Davenport, assistant engineer.

Money statement.

July 1, 1903, balance unexpended	[a]$246.01
Amount allotted from appropriation for maintenanee of river and harbor improvement, act of April 28, 1904	865.00
	1,111.01
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	54.53
July 1, 1904, balance unexpended	1,056.48
July 1, 1904, outstanding liabilities	55.00
July 1, 1904, balance available	1,001.48
Amount (estimated) required annually by existing project	[b]1,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	8,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act—	
Approved June 18, 1878	$10,000
Approved March 3, 1879	8,000
Approved June 14, 1880	10,000
Approved March 3, 1881	8,000
Passed August 2, 1882	30,000
Approved July 5, 1884	9,000
Approved August 5, 1886	7,500
Of August 11, 1888	10,000
Approved September 19, 1890	8,000

By act—	
Approved July 13, 1892	$8,000
Of August 18, 1894	4,000
Passed June 3, 1896	15,000
Approved March 3, 1899	9,000
Approved June 13, 1902	2,000
Allotted from act approved April 28, 1904	865
Total	139,365

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[a] This amount is $18.53 in excess of that given in 1903 report, the additional amount being refundments in 1896 and 1899 not previously credited.

[b] Project should be modified to make annual expenditure for maintenance $3,600.

COMMERCIAL STATISTICS, SEASON OF 1903.

Rafted logs towed out of St. Croix River	feet B. M.	193,000,000
Rafted lumber, etc., towed out of St. Croix River:		
Lumber	feet B. M.	185,035,864
Shingles	number	54,107,250
Laths	do	48,604,250
Pickets	do	20,278
Total tonnage, exclusive of loose logs	tons	1,072,860
Loose logs run on river above Stillwater	feet B. M.	245,675,230
	tons	859,863
Number of steamboats engaged in rafting business out of Stillwater		30
Number of steamboats engaged in passenger excursion business		4
Passengers carried		12,000

REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

St. Paul, Minn., *June 30, 1904.*

Major: The following report on the improvement of the St. Croix River, Wisconsin and Minnesota, for the fiscal year ending June 30, 1904, is respectfully submitted:

Other than repairs on the dredging fleet in 1902 no work has been done in connection with the improvement of the St. Croix River since the season of 1900, when the dredging fleet was operated on the river between Taylors Falls and Stillwater in dredging through the bars, construction of wing and training dams, and the removal of obstructions from the channel.

Examination during the season of 1903 indicated that for the maintenance of the low-water channel between Taylors Falls and Stillwater, repairs on the wing and training dams would be required and that some of the bars required redredging, also that the large accumulation of sunken logs in the channel should be removed to permit the safe movement of steamboats.

Dredging through the bars and repair of the training dams in the vicinity of Hudson, Wis., was also found to be required, to permit the movement of steamboats and rafts through Lake St. Croix at low-water stages.

Other than the running of loose logs there has been but little traffic on the St. Croix River during the past two seasons, the control of the water for logging purposes preventing the successful operation of steamboats; such steamboat operations as there have been were confined to a very limited excursion business between the points above mentioned.

The St. Croix dredging fleet consists of one self-propelling 10-inch centrifugal pump dredge and six barges. All of these boats are in fair condition, but before the improvement of the river can be resumed, it is estimated that repairs costing $1,000 will be necessary to the hulls of the boats and the dredge machinery.

Respectfully submitted.

R. Davenport,
Assistant Engineer.

Maj. Geo. McC. Derby,
Corps of Engineers.

Z 5.

IMPROVEMENT OF MINNESOTA RIVER, MINNESOTA.

The approved project and the report of progress of the work up to June 30, 1903, will be found in the Report of the Chief of Engineers for 1904, Part 1, page 426.

There has been expended during the past fiscal year the sum of $1.90.

After the spring high water of 1903 had subsided a small break was discovered at the west end of the dam. The dam is regularly inspected and there does not appear to have been any material increase in the break since it was first discovered. Repairs should be made as soon as practicable, the estimated cost being $900.

The dredge *St. Croix* has been and is proposed to be used for dredging the bar at the outlet of the river. Repairs are necessary to the plant and this work should be charged with a portion of the expense, about $500.

Owing to the lack of funds no work was done during the year.

Money statement.

July 1, 1903, balance unexpended	$15.10
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1.90
July 1, 1904, balance unexpended	13.20
July 1, 1904, outstanding liabilities	1.71
July 1, 1904, balance available	11.49
Amount (estimated) required for completion of existing project	[a] 500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	3,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act—	
Approved March 3, 1867	$37,500
Approved July 11, 1870	10,000
Approved March 3, 1871	10,000
Approved June 10, 1872	10,000
Passed March 3, 1873	10,000
Approved June 23, 1874	10,000
Approved March 3, 1875	10,000
Approved August 14, 1876	$10,000
Approved June 18, 1878	10,000
Of August 11, 1888	10,000
Passed June 3, 1896	4,000
Approved March 3, 1899	1,000
Total	132,500

COMMERCIAL STATISTICS.

Owing to the precarious condition of the channel at the mouth of the river, navigation on the Minnesota River has been practically confined of recent years to irregular operations of excursion steamers from St. Paul, Hastings, Stillwater, etc., to Shakopee. The Minnesota River has also become a popular resort for a large number of steam and naphtha launches, operated from St. Paul and other river points.

Statistics of number of trips made and passengers carried by the various boats engaged in this navigation during the season of 1903 have not been obtainable.

Z 6.

IMPROVEMENT OF RED RIVER OF THE NORTH, MINNESOTA AND NORTH DAKOTA.

The approved project and the report of progress of the work up to June 30, 1903, will be found in the Report of the Chief of Engineers for 1904, Part 1, page 427.

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[a] Project should be modified to make annual expenditure for maintenance $1,400.

During the past fiscal year there has been expended the sum of $3,489.83 upon the Red River and its principal tributary, Red Lake River.

The work consisted of dredging in Red River in the vicinity of Grand Forks, N. Dak. Details will be found in the appended report of Mr. R. Davenport, assistant engineer. With the limited appropriations available for this work the plant can not be profitably employed, but is laid up annually during most of the working season. On Red Lake River nothing could be done during the past year excepting the care of the plant, which is a fixed charge without any productive return. The cost of the working plant for Red River and Red Lake River was about $25,000, and the cost of caring for this plant and of repairs on account of deterioration continues without intermission. The work now being done, and requiring to be done annually hereafter, is in fact for maintenance of the existing improvement only.

Money statement.

July 1, 1903, balance unexpended	[a]$3,732.15
Amount allotted from appropriation for maintenance of river and harbor improvement, act of April 28, 1904	1,623.00
	5,355.15
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	3,489.83
July 1, 1904, balance unexpended	1,865.32
July 1, 1904, outstanding liabilities	105.00
July 1, 1904, balance available	1,760.32
Amount (estimated) required for completion of existing project	[b]6,320.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	15,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

ABSTRACT OF APPROPRIATIONS.

By act—	
Approved August 14, 1876	$10,000
Approved June 18, 1878	30,000
Approved March 3, 1879	25,000
Approved June 14, 1880	20,000
Approved March 3, 1881	18,000
Passed August 2, 1882	10,000
Approved July 5, 1884	10,000
Approved August 5, 1886	50,000
Of August 11, 1888	20,000
Approved September 19, 1890	25,000

By act—	
Approved July 13, 1892	$25,000
Of August 18, 1894	15,000
Passed June 3, 1896	20,000
Approved March 3, 1899	25,000
Approved June 13, 1902	10,000
Allotted from act approved April 28, 1904	1,623
Total	314,623

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[a] This amount is $7.90 in excess of that given in the 1903 report, the additional amount being refundment in 1901 not previously credited.

[b] Project should be modified so as to make annual expenditure for maintenance $7,500.

COMMERCIAL STATISTICS.

Red River of the North.—Two steamboats from 50 to 100 tons burden and about 30 inches draft, with a fleet of ten 100-ton barges, were operated on the river from Grand Forks, N. Dak. Total freight carried, 28,353 tons.

Red Lake River.—Two steamboats of about 25 tons burden and about 30 inches draft were operated on river and lake traffic, and five steamboats from 50 to 100 tons burden and from 36 to 42 inches draft were engaged exclusively in lake traffic in connection with logging operations, Freight carried, 600 tons; passengers carried, 300; logs run, 82,000,000 feet B. M.

REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

St. Paul, Minn., *June 30, 1904.*

Major: The following report of operations in the improvement of the Red River of the North, Minnesota and Dakota, "General improvement," during the fiscal year ending June 30, 1904, is respectfully submitted.

SEASON OF 1903.

On completion of channel cut No. 5, dredging through the bars north of Grand Forks, N. Dak., was discontinued July 2, and the dredging fleet was then moved to a point 21 miles by water south of Grand Forks, where the improvement of the channel was resumed.

The work on the bars south of Grand Forks was continued until July 25, when the season's work was closed, available funds being exhausted, and the dredging fleet was then returned to Grand Forks and laid up.

Total excavation	cubic yards	7,125
Length of channel cut	linear feet	2,665
Training dams formed with excavated material	do	2,665
Length of river worked over	miles	9

Dredging in detail.

Number of cut.	Location.	Excavation.	Channel cut.	Training dams.	Miles worked over.
		Cu. yds.	*Linear ft.*	*Linear ft.*	
5	Sec. 6, T. 154, R. 50	800			
6	Sec. 33, T. 150, R. 49	775	240	240	
7	Sec. 33, T. 150, R. 49	675	350	350	
8	Sec. 28, T. 150, R. 49	1,100	375	375	1.0
9	Sec. 29, T. 150, R. 49	475	200	200	.5
10	Sec. 29, T. 150, R. 49	750	400	400	
11	Sec. 20, T. 150, R. 49	425	200	200	1.5
12	Sec. 20, T. 150, R. 49	750	300	300	1.5
13	Sec. 20, T. 150, R. 49	150	100	100	1.5
14	Sec. 8, T. 150, R. 49	1,225	300	300	3.0
	Total	7,125	2,665	2,665	9.0

Steamer *Ogama*, operating in connection with the dredging fleet, towing the dredge, wood barges, etc., made 19 trips—miles run, 320; wood loaded, 29¾ cords. Steamer *Ogama*, operated as a snag boat, worked over 35 miles of river, removing 12 overhanging trees, 8 to 24 inches in diameter; 22 snags, 6 to 24 inches in diameter; 6 stumps, 12 to 17 inches in diameter; and 59 bowlders, containing 9 cubic yards of stone.

SEASON OF 1904.

On account of lack of available funds for the work, the continuation of the improvement of the Red River was not resumed this season.

The Red River dredging fleet, laid up at Grand Forks, N. D., consists of the following boats: Dredge *Otter Tail*, Osgood dipper dredge, hull 75 feet by 27.5 feet by 6 feet; steamer *Ogama*, stern-wheel steamboat, hull 100 feet by 22.9 feet by 4 feet; 3 wood barges, hulls 64 feet by 16 feet by 3 feet; 1 slide scow, hull 64 feet by 16 feet by 3 feet; 1 quarter boat, hull 45 feet by 16 feet by 3 feet; 1 warehouse boat, hull 45 feet by 16 feet by 2 feet; and 4 skiffs.

With the exception of two of the wood barges, quarter boat, and warehouse boat, the fleet is in fair condition for future work, but before dredging operations can be resumed it is considered that the following repairs, at cost noted, will be necessary:

2 wood barges, complete repair, at $650 each	$1,300
1 quarter boat, new hull	450
1 warehouse boat, new hull	450
General repairs, hulls and machinery of steamboat and dredge	500
Total	2,700

RED LAKE RIVER.

Other than the care of boats and property at Thief River Falls, Minnesota, there has been no work of improvement on Red Lake River since the season of 1902, when the section of river between High Landing and Thief River Falls was cleared of obstructions to steamboat navigation, snags, overhanging trees, and bowlders.

The Red Lake River derrick fleet, operating from Thief River Falls, consists of the following boats: 1 hand-power derrick boat, hull 42 feet by 18 feet by 2½ feet; 1 quarter boat, hull 52 feet by 12 feet by 2 feet; 1 flatboat, hull 24 feet by 14 feet by 2½ feet; and 1 skiff. All of these boats are in fair condition, but will require repairs estimated to cost $500 for calking and painting, before they can again be used in the work of improvement.

Very respectfully, your obedient servant,

R. DAVENPORT, *Assistant Engineer.*

Maj. GEO. McC. DERBY,
Corps of Engineers.

Z 7.

IMPROVEMENT OF WARROAD HARBOR AND WARROAD RIVER, MINNESOTA.

The approved project and the report of progress of the work up to June 30, 1903, will be found in the Annual Report of the Chief of Engineers for 1904, Part 1, page 429.

The project for this work is limited to the expenditure of $48,000, already appropriated, in the construction of a dredge and in two seasons' work thereafter. By authority of the Chief of Engineers a change was made in the proposed channel to be dredged at the mouth of the river and across the outer bar, the new location being on a straight line and therefore more convenient for navigation. A map showing the old and new location and the progress of the work is submitted herewith.

There had been expended to June 30, 1904, the sum of $33,893.27.

The work during the year consisted in the completion of a self-propelling hydraulic dredge of the "seagoing, hopper" type, and about two months' dredging in Warroad River, producing a channel 100 feet wide and 6 feet deep across the inner bar at the mouth of the river, formerly only 3½ feet deep. Two photographs of the dredge are submitted herewith. Full description of the dredge and details of work done will be found in the appended report of Mr. R. Davenport, assistant engineer.

Money statement.

July 1, 1903, balance unexpended	$42,575.22
June 30, 1904, amount expended during fiscal year, for works of improvement	28,468.49
July 1, 1904, balance unexpended	14,106.73
July 1, 1904, outstanding liabilities	2,616.00
July 1, 1904, balance available	11,490.73

ABSTRACT OF APPROPRIATIONS.

By act approved—	
March 3, 1899	$3,000
June 13, 1902	45,000
Total	48,000

COMMERCIAL STATISTICS.

The town of Warroad, now 4 years old, has a population of 700, and the adjacent country is rapidly filling up with settlers. The imports of Warroad increased from 254 tons in 1900 to 2,754 tons in 1904. During the same period the exports increased from 1,215 tons to 9,929 tons.

Up to this time Warroad Harbor has had no regular lake traffic, the condition of the entrance to the harbor not having been such as to permit it.

On Lake of the Woods there are at present 25 or more registered Canadian boats, ranging from 30 to 486 tons burden, some of which occasionally visit Warroad Harbor when conditions are favorable.

The United States boats connected with Warroad Harbor are the propellers *Mo-no-puck*, 30 tons, and *Knute Nelson*, 100 tons, the latter in course of construction and to be completed early in August.

REPORT OF MR. R. DAVENPORT, ASSISTANT ENGINEER.

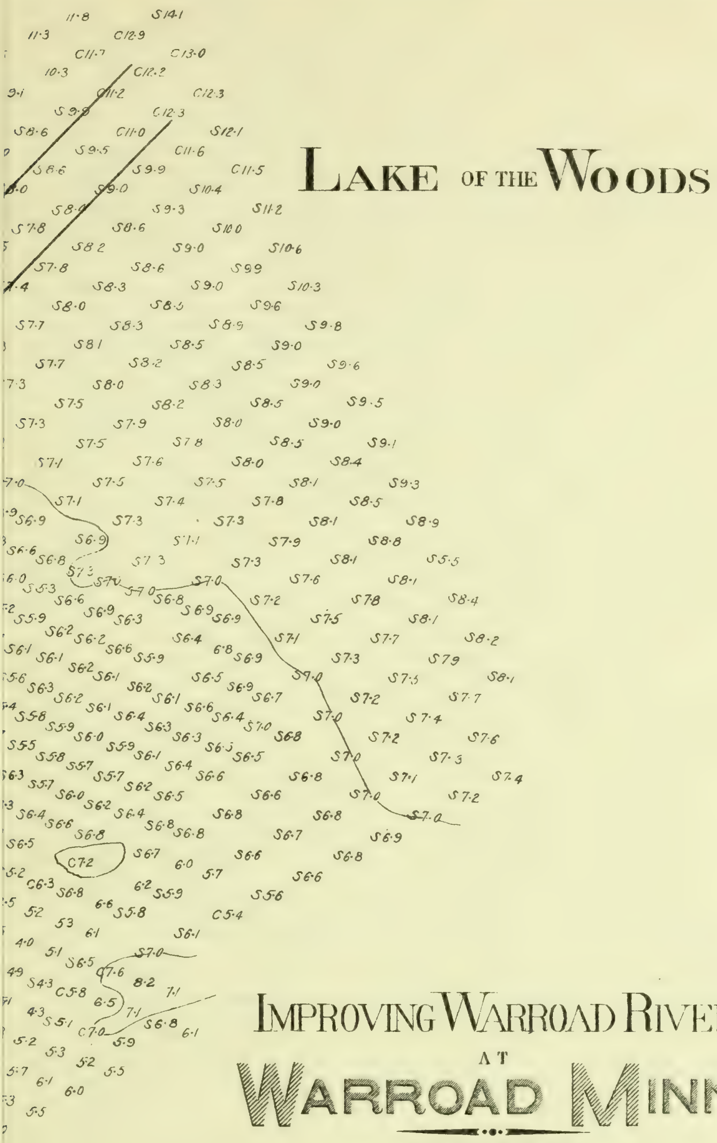
St. Paul, Minn., *June 30, 1904.*

Major: The following report on the improvement of Warroad Harbor and River, Minnesota, for the fiscal year ending June 30, 1904, is respectfully submitted:

The construction of the dredging plant in connection with this work was completed early in May of this season, at a total cost of $29,129.92 for the dredge, wood barge, pipe floats, and small boats.

The dredge is of the "seagoing hopper type" with stern wheel, but is also adapted and equipped for use with a supported discharge pipe for river channel and inner harbor dredging.

With the exception of the modeled portions of the bow and stern of the hull, which are of white oak, the hull and superstructure of the dredge are constructed entirely of Washington fir; the barge and pipe floats are constructed of tamarac lumber obtained in the vicinity of Warroad. Dimensions of dredge: Length of hull, 100 feet; width midship at main deck, 27 feet; depth of hull midship, 8 feet 6 inches; length over all, including stern wheel and revolving cutter on the bow, 158 feet; height of hull and superstructure, keel to top of cabin transom, 25 feet 4 inches; draft light, 4 feet 2 inches; draft loaded, 6 feet 4 inches. The sand pit, located midship of the hull, is of 100 cubic yards capacity and is operated by 10 shutters, controlled by handpower worm gears. The main deck of the dredge is devoted entirely to the machinery; the cabin, offices, and quarters, with accommodations for a crew of 11 men, are all on the upper deck.

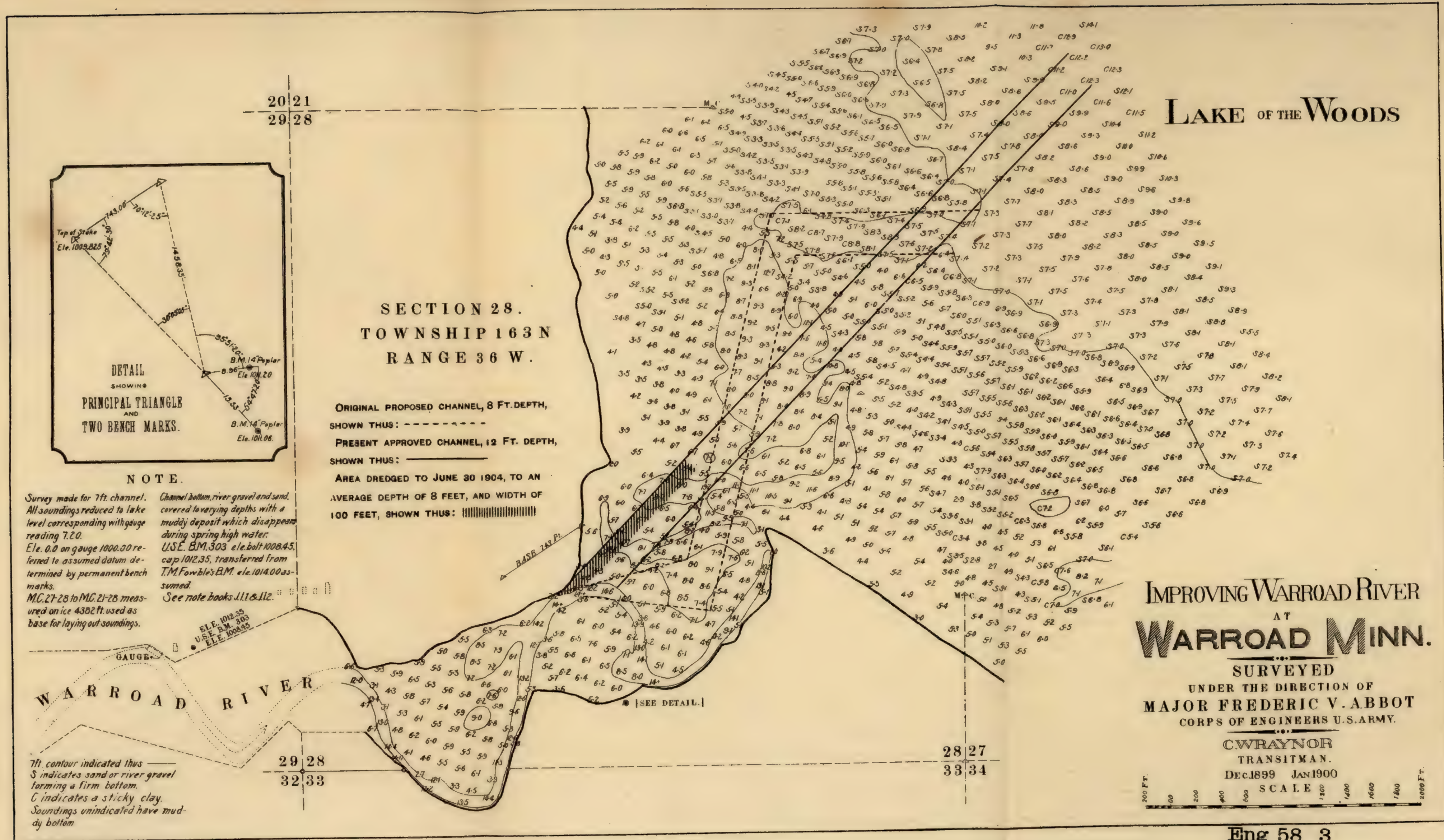


IMPROVING WARROAD RIVER
AT
WARROAD MINN.

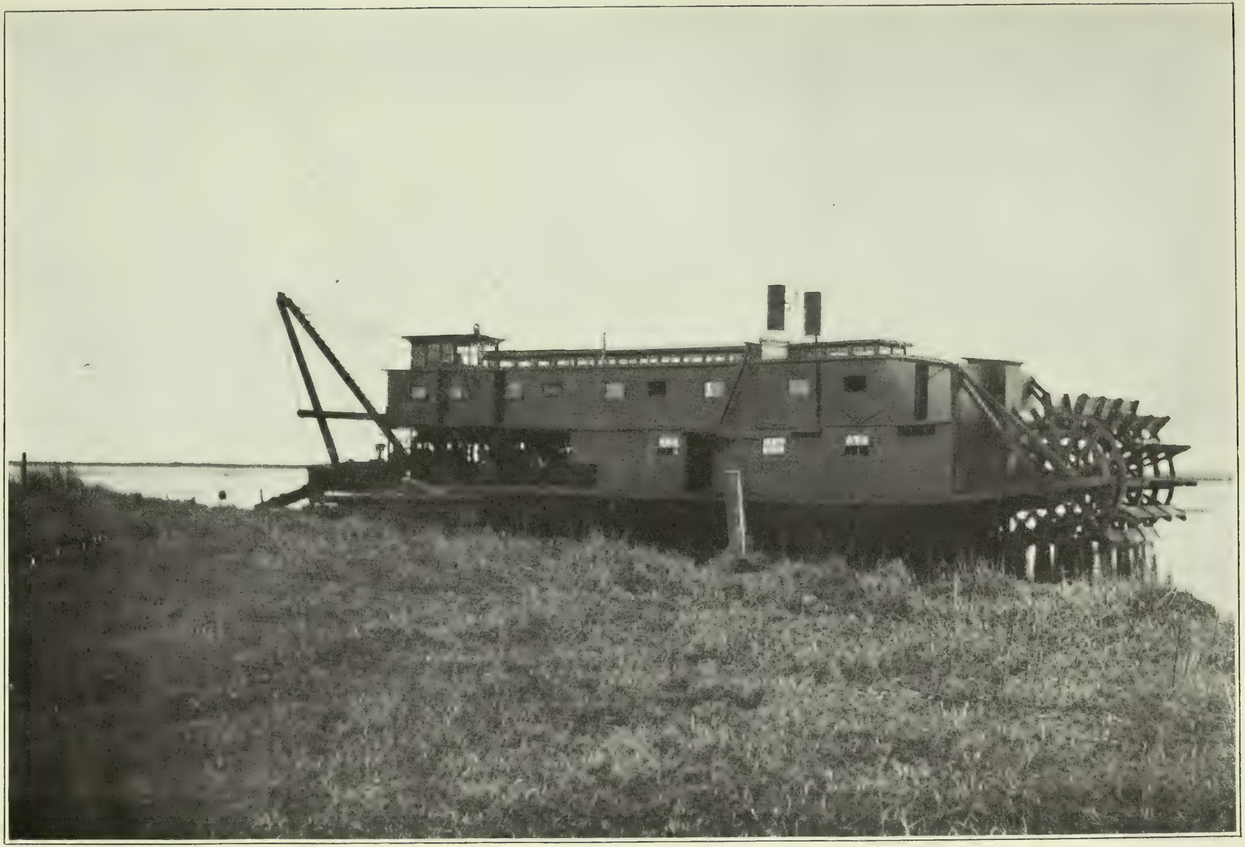
SURVEYED
UNDER THE DIRECTION OF
MAJOR FREDERIC V. ABBOT
CORPS OF ENGINEERS U.S. ARMY.

C. W. RAYNOR
TRANSITMAN.
DEC. 1899 JAN. 1900

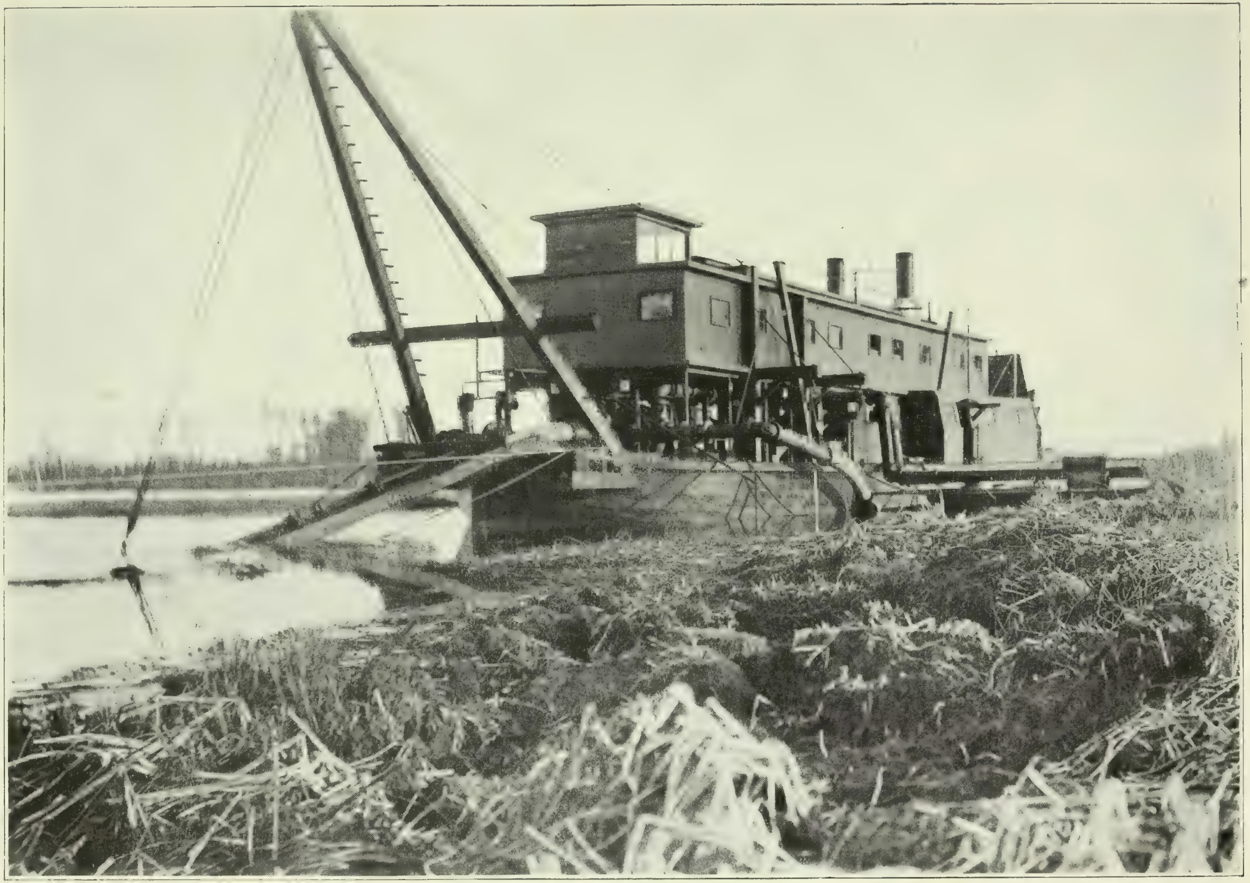
SCALE
200 FT. 00 200 400 600 1200 1400 1600 1800 2000 FT.


LAKE OF THE WOODS
IMPROVING WARROAD RIVER AT WARROAD MINN.
SURVEYED UNDER THE DIRECTION OF MAJOR FREDERIC V. ABBOT CORPS OF ENGINEERS U.S. ARMY.
C. W. RAYNOR TRANSITMAN.
DEC. 1899 JAN. 1900
SCALE
200 FT. 0 200 400 600 800 1000 1200 1400 1600 1800 2000 FT.
SECTION 28. TOWNSHIP 163 N RANGE 36 W.
ORIGINAL PROPOSED CHANNEL, 8 FT. DEPTH, SHOWN THUS: - - - - - - - - -
PRESENT APPROVED CHANNEL, 12 FT. DEPTH, SHOWN THUS: ————
AREA DREDGED TO JUNE 30 1904, TO AN AVERAGE DEPTH OF 8 FEET, AND WIDTH OF 100 FEET, SHOWN THUS: ||||||||||||||||||
DETAIL SHOWING PRINCIPAL TRIANGLE AND TWO BENCH MARKS.
Top of Stake Ele. 1009.825
743.00
70°12'25"
1458.35
B.M. 14" Poplar Ele. 1011.20
B.M. 14" Poplar Ele. 1011.06.
NOTE.
Survey made for 7ft. channel. All soundings reduced to lake level corresponding with gauge reading 7.20.
Ele. 0.0 on gauge 1000.00 referred to assumed datum determined by permanent bench marks.
M.C. 27-28 to M.C. 21-28 measured on ice 4382 ft. used as base for laying out soundings.
Channel bottom, river gravel and sand, covered to varying depths with a muddy deposit which disappears during spring high water.
U.S.E. B.M. 303 ele. bolt 1008.45, cap 1012.35, transferred from T.M. Fowble's B.M. ele. 1014.00 assumed.
See note books J.1.1 & J.1.2.
7ft. contour indicated thus ———
S indicates sand or river gravel forming a firm bottom.
C indicates a sticky clay.
Soundings unindicated have mud-dy bottom
ELE. 1012.35 U.S.E. B.M. 303 ELE. 1008.95
GAUGE
WARROAD RIVER
BASE 743 Ft.
SEE DETAIL.
20 21 / 29 28
29 28 / 32 33
28 27 / 33 34
M.C.

THE NORRIS PETERS CO. PHOTO LITHO., WASHINGTON D.C.



U. S. DREDGE AT WARROAD, MINN. SIDE VIEW.



U. S. DREDGE AT WARROAD, MINN. VIEW SHOWING ARRANGEMENT OF SUCTION AND DISCHARGE.

The machinery of the dredge consists of two 12-inch centrifugal pumps; one 16-horsepower vertical engine operating the revolving cutter; one 20-horsepower horizontal engine operating the cutter hoist, chain drums, and rope spools; two 10 by 60 inch stern-wheel engines; one 6 by 10 inch duplex force pump; and four hand-power worm gears for manipulating the sand pit shutters. The power is supplied by two 75-horsepower Scotch marine boilers.

The centrifugal pumps are arranged to take material through trailing suction ends from both sides of the dredge, and one of the pumps is also connected with the suction end of the revolving cutter, for dredging in clay or other hard material. In connection with the use of the side suctions, when the dredge is in free motion, suction ends designed for working in clay, mud, and sand, the latter with water jets, form part of the equipment.

The machinery of the dredge was satisfactorily tested and the work on the proposed channel from the inner harbor to deep water in the lake was commenced on the 7th day of May.

The work so far accomplished by the dredge has been the excavation of the material for 1,380 linear feet on the line of the proposed channel to an average width of 100 feet and mean depth of 8 feet. Total excavation, 8,625 cubic yards, at an average cost of 21⅔ cents per cubic yard, all expenses—labor, fuel, supplies, subsistence, etc.—included. Cost of subsistence per ration, 44 cents.

Owing to the very low stage of water in Lake of the Woods so far this season there has not been a sufficient depth of water on the line of the proposed channel to float the dredge, and it has consequently only been possible to operate the dredge from the inner end of the channel and to use the one centrifugal pump connected with the revolving cutter, the working capacity of the dredge being thereby reduced about one-half. The material so far encountered in dredging has been very difficult to excavate, being about equal quantities of hard pan and mud, the latter full of the tough fibrous roots of the bulrush and other aquatic plants. The conditions as to increased depth of water and the nature of the material to be excavated are, however, steadily improving as the channel is advanced through the swamp in the direction of the lake.

Since the opening of the dredging season, the time of five and one-half days has been lost through stormy weather, wind and sea from the open lake making it at times impossible to operate the dredge and hold it in position in the channel; other than that, however, there has been no delay or loss of time from any cause.

Very respectfully, your obedient servant,

R. Davenport,
Assistant Engineer.

Maj. Geo. McC. Derby,
Corps of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS RELATIVE TO THE ADVISABILITY OF CONTINUING THE WORK OF IMPROVEMENT AT WARROAD HARBOR AND RIVER, MINNESOTA, OR OF MODIFYING THE PROJECT THEREFOR.

[Printed in House Doc. No. 396, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, January 7, 1904.

Sir: By letter of April 25, 1903, there was transmitted to this office, by the chairman of the Committee on Rivers and Harbors of the House of Representatives, a resolution of the committee from which the following is an extract:

Resolved by the Committee on Rivers and Harbors, That the Board of five engineer officers established by section 3 of the river and harbor act of June 13, 1902, be requested to make reports to Congress not later than the first Monday in December, 1903, upon the following projects, with a view to making recommendations upon the desirability of continuing the same, or any modification thereof, or to report as specifically stated with the designation of the respective projects: * * * Warroad Harbor and Warroad River, Minn.—

and I have the honor to submit herewith a report on the subject, dated December 22, 1903, by the Board of Engineers for Rivers and Harbors.

The sum of $48,000 has been appropriated for the improvement of this locality, the existing project providing for securing a channel 7 feet in depth and about 275 feet in width over the bar at the mouth of the river. The Board has carefully considered all the data available on the subject, and I concur in its conclusion that it is desirable to carry out the present project and to maintain the channel over the bar as long as is possible with the funds now available, the desirability of continuing or abandoning the improvement to be then determined.

I recommend that this letter and the accompanying report be transmitted to the Speaker of the House of Representatives for the information of Congress, as requested in the resolution above referred to.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

The Board of Engineers for Rivers and Harbors,
Washington, D. C., December 22, 1903.

General: By first indorsement, Office Chief of Engineers, United States Army, May 1, 1903, there was referred to the Board of Engineers for Rivers and Harbors a resolution adopted by the Committee on Rivers and Harbors of the House of Representatives, wherein there was required, among other things, the opinion of the Board upon the advisability of continuing the work of improvement at Warroad Harbor and Warroad River, Minnesota, or modifying the project therefor.

The Board has considered all data obtainable in this case, including the accompanying memorandum prepared by the district officer, giving a history of this improvement, and the further information contained in third indorsement thereon.

Warroad River is for a short distance a navigable tributary of the Lake of the Woods. At its mouth is situated the town of Warroad. The surrounding country is practically a wilderness, and has but recently been opened for settlement. A custom-house has been established there. Warroad is the only harbor on the American side of the lake.

The emergency river and harbor act approved June 6, 1900, made provision for a preliminary examination and survey of Warroad Harbor and River, Minnesota. The report of this examination and survey, made by Major Abbot, is printed in House Document No. 92, Fifty-sixth Congress, second session, and in the Annual Report of the Chief of Engineers for 1901, page 2356 et seq. On this survey was based the existing project, which provides for the construction of a dredge at an estimated cost of $25,000 and $10,000 per annum for operating expenses, with a view to providing a channel 7 feet in depth and about 275 feet in width over the bar at the mouth of the river, where there is at present a depth of about 5 feet. Appropriations for this port have been made as follows:

Act of March 3, 1899	$3,000
Act of June 13, 1902	45,000
Total	48,000

Under these appropriations a dredge is being constructed, which in the near future will be completed and ready for operation. It is thought that a channel of the desired depth, with less than the projected width, can be dredged the first year.

In his report Major Abbot states:

> It has been difficult to determine the stability of the existing channels, the opinions of the local pilots being exceedingly contradictory, and the survey of Mr. Raynor being the first really reliable information that was obtainable. It is presumed, however, that, like most of the river entrances to lakes of this class, the channel is shifting, so that dredging will be but a temporary expedient. It would be undoubtedly necessary to keep a dredge in commission at this point.

From an examination of the map the Board is led to believe that the proposed channel will not be self-maintaining.

The Lake of the Woods is quite a large body of water, covering about 1,500 square miles. It is reported that there are over 100 vessels, having a maximum draft of 8 feet, engaged in the commerce of the lake and its tributaries. The commerce of Warroad was about 600 tons in 1899, since which time it appears to have increased at least twentyfold.

The district officer expresses the opinion that—

> The locality is worthy of the expenditure of at least $45,000, * * * as by that time the utility or uselessness of maintaining a navigable entrance to Warroad River will have been demonstrated by the rapid growth of Warroad into a place of importance or by its continuance in its present embryonic state.

The greater part of the funds appropriated for this improvement have been expended in the construction of a dredge for the sole purpose of creating a channel over the bar. If the project is abandoned now the result of the expenditures up to the present time will be nil. The district officer estimates that after the completion and equipment of the dredge there will remain available, from the appropriations already made, the sum of $16,134.75. With the expenditure of this sum the projected channel will have been created and maintained for at least two years, at the expiration of which time the desirability of continuing or abandoning the improvement will have been demonstrated.

In view of the foregoing the Board recommends that it is desirable to carry out the present project, and to maintain the channel over the bar as long as is possible with the funds now available, and that the advisability of continuing or abandoning the improvement should then be determined.

Respectfully submitted.

A. M. MILLER,
Lieut. Col., Corps of Engineers.
R. L. HOXIE,
Major, Corps of Engineers.
W. V. JUDSON,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

LETTER OF MAJ. R. L. HOXIE, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Paul, Minn., June 4, 1903.

SIRS: In compliance with Department indorsement dated May 23, 1903, upon letter of the Board of May 21, 1903, I have the honor to inclose herewith a memorandum of information desired with respect to Warroad Harbor and Warroad River, Minnesota.

Very respectfully,

R. L. HOXIE,
Major, Corps of Engineers,

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

UNITED STATES ENGINEER OFFICE,
St. Paul, Minn., December 12, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The dredge for Warroad Harbor and River, Minnesota, is practically completed. A small amount of pipe work remains to be done. When the dredge is completed and the outfit supplied ready to begin work it is estimated that there will remain available from the appropriations for that locality $16,134.75.

A fuel barge, floats, and discharge pipe and other articles of outfit will be necessary, and are estimated to cost $2,770. They are included in the estimates, leaving the balance mentioned above.

The amount expended upon the dredge to date is $24,293.10; $1,634 is required to complete, and $2,770 for additional plant. The amount expended in the construction of the dredge does not include office expenses, etc., amounting to about $2,500.

It is estimated that it will cost $7,000 per annum to operate the dredge the first two years. The expenditure of $10,000 will hardly enable the value of the improvement to be tested, as two years is none too long a period for such a test. It is probable that the balance of the appropriation, $16,134, will be required to fully test the matter.

Warroad was only the railroad terminus pending the progress of construction beyond. The road was opened to Warroad in February, 1900; to Beaudette, on Rainy River, in December, 1900; to Fort Francis November, 1901, and finished through to Port Arthur January, 1902. I find no indication that the extension of the railway to Beaudette and

Fort Francis has in any way lessened the importance of Warroad Harbor. Beaudette is a very small place and does very little business; the lake boats reach Fort Francis except at low water, when freight has to be transshipped at the rapids below. My opinion is that the extension of the railroad has had a favorable effect upon the commerce of Warroad and will continue to do so, making the place accessible from Port Arthur, on Lake Superior, as well as from Winnipeg. I inclose herewith tables furnished by the deputy collector of customs at Warroad, which show a rapid increase in the commerce of the place.

G. McC. Derby,
Major, Corps of Engineers.

[Fourth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, December 18, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, inviting attention to third indorsement hereon.

By command of Brig. Gen. Gillespie:

H. F. Hodges,
Major, Corps of Engineers.

[Fifth indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., December 22, 1903.

Respectfully returned to the Chief of Engineers, United States Army, with report of this date.

For the Board:

A. M. Miller,
Lieut. Col., Corps of Engineers,
Senior Member Present.

MEMORANDUM.

The emergency river and harbor act approved June 6, 1900, made provision for preliminary examination and survey of Warroad Harbor and Warroad River, Minnesota. The report of Major Abbot, which was printed in House Document No. 92, Fifty-sixth Congress, second session, and in the Annual Report of the Chief of Engineers for 1901, Part 3, page 2356, et seq., comprises not only the report of preliminary examination, but a general project with estimate of cost. Major Abbot says:

"Warroad River is for a short distance a navigable tributary of the Lake of the Woods from the American side. At its mouth is situated the hamlet of Warroad. * * * The commerce of the lake is very considerable, being carried in some eight steamers, some of them drawing as much as seven feet of water, loaded. The entire Canadian shore is said to be reasonably well settled and with a number of points at which boats can land in safety. The Rainy River, connecting the Lake of the Woods with Rainy Lake, is navigable up as far as Koochiching, and a very considerable commerce is developing on this river in connection with the transportation of exports from the United States to Winnipeg. A shorter route to Winnipeg is provided by a new railroad just completed from Winnipeg to Warroad, provided the boats are able to enter this harbor, the only practicable harbor on the American side.

"On the American side of the lake the country is as yet a wilderness, consisting almost entirely of Indian reservation, portions of which only have been thrown open to settlement. Warroad is one of these localities thus opened. A railroad running from Warroad toward the Red River Valley is projected. If this is built Warroad will become quite a distributing point. There is already a custom-house there, and some 600 tons of merchandise passed through the custom-house last year. Considering that this is the only American harbor on the lake, and that the lake and river form part of the international boundary, it seems not improper for the Government to provide suitable harbor facilities if they can be secured for a reasonable sum. * * *

"In consideration of the facts heretofore stated in this report, I believe the locality to be worth the expenditure of at least $45,000 under the project outlined above, as by that time the utility or uselessness of maintaining a navigable entrance to Warroad River will have been demonstrated by the rapid growth of Warroad into a place of importance or by its continuance in its present embryonic state." * * *

By act approved March 3, 1899, $3,000 was appropriated for this improvement, and by the act approved June 13, 1902, $45,000 more. Of this total of $48,000 there has been expended, including outstanding obligations, about $16,000. Work upon the dredge to be used upon the improvement is in progress and will probably be completed about the 1st of October.

There is little to add to the foregoing statement of Major Abbot, in which I concur. The railroad from Winnipeg to Warroad has been extended toward Port Arthur, crossing Rainy River at Beaudette. Settlers are going into the country on the American side of Rainy River, and works of considerable magnitude are in contemplation at Koochiching, the head of navigation on Rainy River, for the utilization of the water power there. The expenditure of the $48,000 already appropriated will probably serve to determine the relative importance of this improvement.

R. L. Hoxie,
Major, Corps of Engineers.

Exports from port of Warroad, Minn.; also showing railroad tickets sold at Warroad station.

[Railroad construction material excluded.]

Month.	Weights.	Number tickets sold.	Ticket sales.
1900.	*Pounds.*		
June	157,065	24	$91.25
July	766,350	91	302.30
August	351,030	48	192.85
September	730	35	150.90
October	40,120	60	243.10
November	48,050	67	215.25
December	1,067,910	76	185.60
Total	2,431,255	401	1,381.25
1901.			
January	921,870	18	59.05
February	400,380	44	48.05
March	726,100	45	91.25
April	791,000	89	151.75
May	243,440	76	133.20
June	255,460	45	74.90
July	576,500	102	202.20
August	365,750	81	244.85
September	644,520	56	126.20
October	367,040	72	167.20
November	517,670	85	161.05
December	209,682	99	150.15
Total	6,019,412	812	1,609.85
1902.			
January	852,060	99	142.00
February	1.384,780	89	206.90
March	1,033,665	103	188.75
April	236,830	105	212.65
May	295,250	95	236.00
June	212,500	99	315.00
July	276,830	143	301.35
August	155,250	120	282.30
September	95,550	63	115.10
October	717,190	100	231.30
November	242,635	273	450.20
December	1,287,710	165	286.45
Total	6,790,250	1,454	2,968.00

Exports from port of Warroad, Minn.; also showing railroad tickets sold at Warroad station—Continued.

Month.	Weights.	Number tickets sold.	Ticket sales.
1903.	*Pounds.*		
January	1,848,145	146	$374.20
February	3,543,410	111	281.80
March	3,899,185	155	345.75
April	2,329,240	169	441.05
May	1,245,445	239	557.70
June	956,450	222	564.90
July	1,853,395	351	361.33
August	590,840	195	713.55
September	435,850	125	360.00
October	906,830	189	352.25
November	732,380	354	684.69
Total	18,341,170	2,256	5,037.22

Only eleven months of the year 1903 are shown.
Dated at the port of Warroad, Minn., November 30, 1903.
Correct.

Chas. A. Moody,
Deputy Collector Customs.

Imports, Warroad, Minn., March 1, 1900, to December 1, 1903.

[Railroad construction material not included.]

WEIGHT IN POUNDS.

Month.	1900.	1901.	1902.	1903.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
January	(*a*)	38,180	59,500	304,712
February	(*a*)	21,450	189,220	299,216
March	54,040	43,370	204,860	645,221
April	17,990	92,240	261,690	458,193
May	20,800	73,300	325,120	445,605
June	38,130	20,390	163,270	717,129
July	15,750	34,050	71,420	559,887
August	58,720	27,190	97,310	189,526
September	34,550	19,870	694,127	395,964
October	40,210	55,860	332,515	306,463
November	111,620	56,090	266,837	727,976
December	111,620	149,130	306,605	(*b*)
Total	503,430	631,120	2,972,504	5,049,892

[a] M. and M. Railroad constructed to Warroad, March 1, 1900.
[b] Statement only shows eleven months, 1903.

AMOUNT PAID FREIGHT.

Month.	1900.	1901.	1902.	1903.
January	....	$381.80	$494.69	$1,068.16
February	....	214.50	770.98	958.65
March	$354.18	433.70	477.04	2,037.58
April	234.71	922.40	771.46	1,545.49
May	233.25	733.00	695.61	1,410.71
June	392.72	203.90	703.35	1,932.36
July	155.28	340.50	491.63	2,617.78
August	412.23	271.90	505.80	1,167.82
September	339.70	198.70	897.25	1,100.45
October	408.35	558.60	729.24	1,357.74
November	808.91	560.90	860.74	2,331.93
December	629.96	1,491.30	1,355.15	....
Total	3,969.29	6,311.20	8,752.94	17,528.67

Z 8.

SURVEY OF OTTER TAIL LAKE AND OTTER TAIL RIVER, RED LAKE AND RED LAKE RIVER, MINNESOTA, AND BIG STONE LAKE AND LAKE TRAVERSE, MINNESOTA, AND SOUTH DAKOTA.

The approved project and report of progress of the work up to June 30, 1903, will be found in the Annual Report of the Chief of Engineers for 1904, Part 1, page 430.

Amount expended on all projects to June 30, 1904, $16,298.50.

During the year the detached surveys commenced in the previous fiscal year were completed and hydrological measurements were continued until May 15, 1904.

It is proposed to reserve the available funds for the purpose of making hydrological observations during the next flood affecting these localities.

Money statement.

July 1, 1903, balance unexpended	$10,793.91
June 30, 1904, amount expended during fiscal year	1,592.41
July 1, 1904, balance unexpended	9,201.50

ABSTRACT OF APPROPRIATIONS AND ALLOTMENTS.

By act—	
Passed June 3, 1896 (allotment for Big Stone Lake, etc.)	$2,500
Approved March 3, 1899—	
Appropriation for Big Stone Lake, etc	5,000
Appropriation for Red Lake and Red Lake River	5,000
Appropriation for Otter Tail Lake, etc	3,000
Approved June 13, 1902 (allotment for continuing surveys)	10,000
	25,500

SURVEYS OF OTTER TAIL LAKE AND RIVER AND RED LAKE AND RED LAKE RIVER, MINNESOTA, AND OF BIG STONE LAKE AND LAKE TRAVERSE, MINNESOTA AND SOUTH DAKOTA.

[Printed in House Doc. No. 539, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, February 10, 1904.

Sir: I have the honor to submit for transmission to Congress the accompanying report of August 11, 1903, by Maj. R. L. Hoxie, Corps of Engineers, called for by items in the river and harbor act approved June 13, 1902, as follows:

> Otter Tail Lake and Otter Tail River, Minnesota: Continuing survey with a view to the construction of a dam at the outlet of said lake; for the purpose of improving the navigation on the Red River of the North, Minnesota.
>
> Red Lake and Red Lake River, Minnesota: Continuing survey with a view to the construction of a dam with locks at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North and the said Red Lake River, Minnesota.
>
> Big Stone Lake and Lake Traverse, Minnesota and South Dakota: Continuing survey with a view to constructing reservoirs therein for the improvement of the navigation of the Minnesota River.

The surveys thus provided for are in continuation of surveys ordered by the river and harbor act approved March 3, 1899, which surveys were themselves practically in continuation of similar investigations by examination and survey authorized by the river and harbor Acts of September 19, 1890, August 18, 1894, and June 3, 1896. The act of March 3, 1899, made specific appropriations, amounting to $13,000, for the survey of these localities, whereas the expenses of the other examinations and surveys, including those ordered by the act of June 13, 1902, were to be paid from the general appropriation made by the respective acts for examinations, surveys, and contingencies.

The localities named in the above-quoted sections of the law are all tributary to the Red River of the North, or the Minnesota River, and the stated object of the works contemplated by the law is the improvement of navigation on these streams.

The estimates of cost presented by Major Hoxie of works specifically named in the law, as quoted, are as follows:

For Red Lake and Red Lake River	$270,456.60
For Otter Tail Lake and Otter Tail River	58,095.00
For Big Stone Lake and Lake Traverse (alternative estimates)	357,957.00 435,266.00 1,176,972.00

For the reasons given, Major Hoxie submits no recommendations as to the advisability of executing the plans proposed by him.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of the act of June 13, 1902, and attention is invited to the views and recommendations of the Board in fifth indorsement[a] thereon, as well as to the report by the division engineer, Col. O. H. Ernst, Corps of Engineers, in third indorsement.[b]

After carefully reviewing the facts, views, and opinions contained in these various reports, the following conclusions are reached:

I concur in the opinion expressed by the division engineer and by the Board of Engineers for Rivers and Harbors that the construction of a dam at the outlet of Otter Tail Lake, for the purpose of improving the navigation of the Red River of the North, and the construction of reservoirs on Big Stone Lake and Lake Traverse, for the improvement of the navigation of the Minnesota River, are works which it is not desirable for the United States to undertake.

I am constrained to dissent from the conclusion in regard to the proposed works at the outlet of Red Lake.

The necessity for dredging to maintain the present navigable depth in the Red River of the North arises, at least in part, from causes which would continue to operate even with the low-water surface raised, as proposed, by the discharge of flood water impounded in Red Lake. I do not think it probable that the construction of the work proposed, which in itself is costly, would do away entirely with the annual dredging charge; and further, the type of lock and dam which can be built for the sum named by the district officer can not be of a permanent character, nor is it probable that any of the works forming part of the plan can be so executed that they will not require an annual charge for operation, and a recurring expenditure for care, repair, and renewal.

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[a] See page 2289.

[b] See page 2287.

The commerce on Red River was 20,086 tons in 1902, and that on Red Lake River, exclusive of logs, which can be run without increased depth, was 500 tons.

At present the improvements carried on in Red River and Red Lake River cost, say, $10,000 per annum. If this annual charge could be saved, it might be proper to expend the total sum of $270,456.60, as estimated by the local officer, in the effort to assist the small navigation now existing; but I do not believe that it would be saved, and fear that, on the contrary, it would be increased. Disregarding the saving of this annual charge, the commerce itself does not appear to me to warrant the expenditure of so large a sum as that named.

For the reasons stated, I do not believe that the United States should construct a dam with locks at the outlet of Red Lake, for the purpose of improving the navigation of the Red River of the North and of Red Lake River.

The matter of protecting the Red River Valley from floods is not touched upon by the law calling for these examinations and surveys, the object of the investigation ordered being simply the improvement of navigation. The district officer's report shows, however, that even were the works at Red Lake carried out as proposed, they would cut off so small a portion of the Red River drainage basin as to have practically no effect upon the flood height.

Very respectfully, your obedient servant,

A. MACKENZIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. WM. H. TAFT,
Secretary of War.

REPORT OF MAJ. R. L. HOXIE, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
St. Paul, Minn., August 11, 1903.

GENERAL: I have the honor to submit the following report upon certain surveys committed to my charge:

The river and harbor act approved June 13, 1902, provides for continuing surveys of Otter Tail Lake and Otter Tail River, Minnesota, of Red Lake and Red Lake River, Minnesota, and of Big Stone Lake and Lake Traverse, Minnesota and South Dakota, with a view to the construction of reservoirs for the improvement of navigation of the Red River and its principal tributary, Red Lake River, and of the Minnesota River. These surveys were commenced under the act approved September 19, 1890, and have been continued under successive acts of Congress having substantially the same object, and in addition the improvement of the Mississippi to result from that of the Minnesota River.

From all of this legislation and from the resulting investigations, it appears that such improvement is contemplated, as in the case of the Upper Mississippi, by impounding the flood water of early spring in reservoirs and releasing it during the low-water period to increase the channel depth at that time; and, also, by limiting in this way the effect of spring freshets in disturbing the regimen of the river or otherwise interfering with navigation. It is apparent that incidental benefit to lands in the Red River Valley, ordinarily flooded in times of freshet, was anticipated, and was, perhaps, the controlling motive in procuring this legislation. It is believed that the intent of the requirement of the present act is to emphasize the latter feature, and for this reason it has been given special consideration.

In the surveys and examinations heretofore there have been no flood measurements; no record has been found of any flood measurements in the Red River Basin. There has been no excessive flood in the Red River Basin since 1897, and no opportunity for observation since that time. Gauge readings at Grand Forks are the only data giving a continuous record of the flood of 1897, and isolated gauge readings, conjecture, and estimate exist alone as to prior floods. A discussion of floods should be predicated upon flood measurements distributed over the watershed in question, but six years have elapsed without a repetition of the flood of 1897, in the Red River Basin, and the irregular occurrence of freshets and their infrequency forbid any definite expectation. The interval between freshets appears to have been sometimes as long as ten years. It seems desirable to submit to the Congress all that is known upon the subject without further delay for consideration in connection with the expediency of further investigation, and for this reason the flood of 1897 is herein discussed. Possibly a theoretical flood with a basis of ascertained fact will not differ more widely in detail from the next real flood than this will differ from its predecessor.

The Red River Basin occupies a depression once covered by the glacial Lake Agassiz. In his monograph (No. 25, U. S. Geological Survey), Mr. Warren Upham describes this locality as follows:

> These streams (Red River and its tributaries) occupy the axial depression of a vast plain of glacial drift and lacustrine and fluvial deposits 40 to 50 miles wide and more than 300 miles long, stretching from Lake Traverse to Lake Winnipeg. This expanse, widely famed for the large harvests and superior quality of its wheat, is commonly called the Red River Valley. It has a very uniform, continuous descent northward, averaging a little less than 1 foot per mile. So slight an inclination is imperceptible to the eye, as is also the more considerable ascent, usually 2 or 3 feet per mile, for the first 10 or 15 miles to the east and west from the Red River. * * *
>
> The Red River has cut a channel 20 to 50 feet deep. It is bordered by only few and narrow areas of bottom land, instead of which its banks usually rise steeply on one side and by moderate slopes on the other to the lacustrine plain, which thence reaches nearly level 10 to 30 miles from the river. Its tributaries cross the plain in similar channels, which, as also the Red River, have occasional gullies connected with them, dry through the most of the year, varying from a few hundred feet to a mile or more in length. Between the drainage lines areas often 5 to 15 miles wide remain unmarked by any water courses. The highest portions of these tracts are commonly from 2 to 5 feet above the lowest. The material of the lower part of this valley plain, shown in the banks of the Red River and reaching several miles from it (excepting a morainic belt of till crossing the river at Goose Rapids), is fine clayey silt, horizontally stratified; but the south end and large areas of each side of the plain are mainly unstratified bowlder clay, which differs from the rolling or undulating till of the adjoining region chiefly in having its surface nearly flat. Both these formations are almost impervious to water, which therefore in the rainy season fills their shallow depressions; but these are very rarely so deep as to form permanent

lakes. Even sloughs that continue marshy through the summer are infrequent, but where they do occur cover large tracts, usually several miles in extent.

The State of Minnesota has for many years been actively engaged in remedying these natural defects by an elaborate system of drainage, which is perhaps of more importance than any other project contemplated for the relief of this valley. It is even possible that much of the trouble attributed to freshets in the river is due to the defective natural drainage of the valley and will disappear when natural drainage is provided.

The Red River flows northward a distance of 395 miles from the town of Breckenridge, Minn., where it is formed by the junction of the Otter Tail and the Bois des Sioux, to the Canadian boundary, with an average slope of 0.49 foot per mile, and with only one reach of about 12 miles in which the slope is a serious obstacle to navigation. The banks are not easily eroded, though subject to sloughing in mass at times, and the width of the channel is moderate and remarkably uniform. It is a river that lends itself readily to improvement by a moderate increase of the low-water flow. Projects for improvement heretofore have been limited to the removal of obstructions in the channel by dredging or otherwise, and have resulted in a low-water depth of 4 feet in the channel below Grand Forks.

About 37 miles above Grand Forks the river is closed to navigation by a series of low fixed bridges. The basin is on the border of the arid lands. Tributaries from the west drain the prairie lands of the Dakotas and may be formidable in flood when the spring thaw discharges over frozen surfaces, but are insignificant in the summer time. The eastern tributaries, heading in the wooded lake region of Minnesota, contribute nearly all of the summer flow. During the period beginning with March, 1899, and ending with June, 1903, during which no floods occurred, the average annual run-off at Grand Forks was approximately 86,000,000,000 cubic feet. Of this amount Red Lake and Otter Tail Lake, with an aggregate drainage area less than one-eighth the total of the river at Grand Forks, contributed about 36,000,000,000.

The Red River is said to have a mean flood range above low water of approximately 16 feet at Breckenridge, 33 feet at Fargo, 50 feet at Belmont, 42 feet at Grand Forks, and 38 feet at Pembina, near the international boundary, while the river banks, with intervening points above or below the mean elevation, gradually increase in average height from 12 feet at Breckenridge to 38 feet at Fargo and 50 feet at Pembina. There is but little bottom land, and whenever the river tops the bank it floods the broad flat plain.

Grand Forks, N. Dak., is the lowest point in the river system where any record was made of the flood of 1897, the most recent well-authenticated flood in the history of the river, and one of the highest. This town is also the focus of discontent as to flood conditions, nearly all complaints originating in this vicinity. It is mainly because of the available record that flood discussion is limited to the river basin above Grand Forks.

The meteorological conditions attending and preceding the flood of 1897 are shown in the accompanying tables and isohyetal diagram[a] compiled from the records of the Weather Bureau. These indicate that between November 1, 1896, when cold weather commenced, and April

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[a] The diagrams and all the maps, except that of the Red River Basin, are omitted from this document.

23, 1897, the date of subsidence of the flood, there was a total average precipitation of about 5.9 inches of water in the Red River Basin above Grand Forks west of the river, and about 7.26 inches in this basin east of the river, falling mainly in the form of snow. With rare exceptions in a few localities the mean daily temperature over the entire river basin remained continuously below the freezing point until March 17, when there were one or two days of mild weather, followed by cold weather which continued until March 28. Then the spring thaw commenced, resulting in the flood of 1897, which attained its maximum at Grand Forks on the 10th of April. While the melting of the snow continued rain was neither general nor excessive.

The precipitation during this whole period of six months was only about one-third of the yearly average, mainly in the form of snow, but continuous and severe cold prevented melting and retarded evaporation until the spring thaw commenced. These are not extraordinary conditions favoring floods. A larger proportion of the annual precipitation to be stored in the form of snow may well be expected, and the spring thaw may be accompanied by excessive and general rainfall. Such a combination may have produced the freshet of 1850, of which there is little record, when the gage at Grand Forks is said to have reached 55, nearly 10 feet higher than the maximum during the flood of 1897. While it is theoretically probable that the flow of the river from south to north may aggravate the effect of freshets through the ice-bound condition of the lower river when the upper river is in flood, this does not appear to have been a factor in the freshet of 1897, nor in the preceding freshets of 1893 and 1882. It is quite clear that disastrous freshets are not to be expected as annual occurrences, and may be separated by many years.

Total precipitation in Red River of the North Basin above Grand Forks, November 1, 1896, to April 23, 1897.

[Inches of rain plus melted snow.]

State and place.	1896.		1897.				Total.	Average.
	November.	December.	January.	February.	March.	April.		
Minnesota:								
Ada	1.90	0.53	0.44	0.74	0.33	0.70	4.64	0.77
Alexandria[a]	1.75	.56	2.15	1.39	1.51	.81	8.17	1.36
Beardsley[a]	2.10	.76	1.83	.82	1.13	1.33	7.97	1.33
Campbell	....	....	3.12	1.20	3.90	.67	8.89	2.22
Crookston	1.30	....	.37	2.30	.94	.39	5.30	1.06
Detroit City	....	.30	1.72	1.07	1.44	1.35	5.88	1.18
Fergus Falls	2.08	.75	1.64	.91	1.46	1.33	8.17	1.36
Lambert	2.65	1.25	.85	1.40	1.01	T.	7.16	1.19
Moorhead	3.09	.73	1.56	1.52	1.34	.92	9.16	1.53
North Dakota:								
Amenia	1.67	.35	.70	1.40	.99	1.49	6.60	1.10
Buxton	1.62	.56	1.25	.66	.89	.90	5.88	.98
Fargo	.70	.26	.36	.77	.96	.89	3.94	.66
Forman	1.07	....	2.04	.79	.99	1.10	5.99	1.20
Gallatin	1.80	1.22	.55	.94	.77	.76	6.04	1.01
Larimore[a]	....	....	.29	.30	1.12	.81	2.52	.63
Mayville	4.33	.35	.60	.60	.85	.49	7.22	1.20
Power	1.83	.25	.65	1.10	.55	T.	4.38	.73
Sheyenne	2.60	1.60	.31	.70	.83	.77	6.81	1.14
University[a]	2.10	.55	.65	.92	.78	.56	5.56	.93
Valley City	1.20	....	.90	1.45	.80	.76	5.11	1.02
Wahpeton	.75	.15	.42	.95	2.09	1.50	5.86	.98
Wild Rice	1.60	.54	.76	1.56	1.71	.71	6.88	1.15
Average	....	....	....	....	....	....	6.68	1.12

[a] Outside of but near the border of the basin.

NOTE.—None of the regular Weather Bureau stations nor the voluntary-observer stations lie in the small South Dakota part of the basin of the Red River of the North.

Daily record of precipitation in the basin of the Red River of the North, March 27 to April 23, 1897.

[T.=trace=less than 0.01 inch.]

State and place.	March—					April—								
	27.	28.	29.	30.	31.	1.	2.	3.	4.	5.	6.	7.	8.	9.
Minnesota:														
Ada	.....	.....	.....	.....	.....	.....	.....	0.43	0.10	.....	.....	.....	.....	.....
Beardsley [a]	0.08	.....	0.05	T.	.....	T.	0.15	.10	.67	T.	0.03	.....	.....	.....
Campbell	.....	.....	.....	.....	.....	.....	.....	.....	.22	0.23	.....	.....	T.	.....
Crookston	.....	.....	.....	0.10	.....	.....	.05	.....	.10	.....	.....	.....	.....	0.05
Detroit City	.....	T.	T.	.32	.....	.....	.....	T.	.04	.30	.....	.....	.....	T.
Fergus Falls	.....	T.	.....	.09	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lambert	.....	.....	.....	.....	.....	.....	.....	.....	T.	.....	.....	.....	.....	.....
Moorhead	.....	0.04	.....	.12	.....	.....	T.	.08	.52	.....	.02	.....	.....	.....
North Dakota:														
Amenia	.....	.....	.....	.01	.....	.....	.08	.12	.33	.....	T.	.....	.....	.....
Buxton	.....	.....	.....	.22	.....	.....	.....	.19	.41	.....	.....	.....	.....	.....
Fargo	.....	.....	.....	.15	.....	.....	.....	.06	.....	.50	.....	.....	.....	.....
Forman	.....	.....	.....	.....	.....	T.	.....	.28	T.	.17	.....	.....	.....	.....
Gallatin	.....	.....	.....	.30	.....	.....	.....	.11	.08	.....	.02	.....	.....	.....
Larimore [a]	.....	.....	.....	.37	.....	.....	.04	.05	.....	.....	.....	.....	.....	.....
Mayville	T.	.....	T.	.....	.....	.....	T.	T.	.15	T.	.....	.....	.....	.....
Power	.....	.....	.....	.....	.....	.....	.....	.....	T.	.....	.....	.....	.....	.....
Sheyenne	.....	T.	T.	.10	T.	.....	.....	.14	.....	.....	.....	.....	.....	.....
University [a]	.....	.....	.....	.....	.....	.....	.06	.28	.....	.....	T.	.06	.....	.....
Valley City	.....	.....	T.	.10	.....	.....	.....	.22	.23	T.	.....	.....	.....	.....
Wahpeton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.25	.77	.....	.....

State and place.	April—													
	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
Minnesota:														
Ada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....
Beardsley [a]	.....	.....	0.11	0.03	.....	0.13	.....	.....	.....	.....	0.11	.....	.....	.....
Campbell	.....	.....	.....	.....	.....	.20	.....	.....	.....	.....	.....	.....	0.02	.....
Crookston	.....	.....	.04	.....	.....	.....	.....	.....	0.05	.....	.....	.....	.10	.....
Detroit City	0.20	.....	.....	.04	.....	.10	.....	.....	.....	T.	.....	.50	.07	.....
Lambert	.....	.....	T.	.....	T.	.....	.....	.....	T.	.....	.....	T.	.....	.....
Moorhead	.....	.....	.08	.08	T.	.....	.....	.....	T.	.....	.....	.14	.....	T.
North Dakota:														
Amenia	.....	.....	.17	.01	T.	.....	.....	.....	.....	.....	.....	.06	.....	.....
Buxton	.....	.....	.30	.....	.....	.....	.....	.....	T.	.....	.....	T.	.....	.....
Fargo	.....	.....	.....	.16	.....	.....	.....	.....	.....	.....	.....	.17	.....	.....
Forman	.....	0.34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.31	.....	.....
Gallatin	.....	.02	.39	.....	0.01	.....	.....	.....	.01	.....	.....	.12	.....	.....
Larimore [a]	T.	.12	.12	.....	.....	.....	.....	0.02	.....	.....	T.	.45	.01	.....
Mayville	.....	.....	.22	.....	.....	.....	.....	.....	.....	.....	.....	.12	T.	.....
Sheyenne	.....	T.	.48	.....	.....	.....	.....	.....	.....	.....	.....	.05	.10	T.
University [a]	T.	.....	.04	.....	.....	.....	.....	.....	.....	.....	.....	.12	.....	.....
Valley City	.....	.....	.31	.....	T.	.....	.....	.....	.....	.....	.....	T.	.....	.....
Wahpeton	.....	.....	.12	.....	.13	.....	.....	.....	.....	.....	.....	.23	.....	.....

[a] Outside of, but near the border of the basin.

NOTE.—None of the regular Weather Bureau stations nor the voluntary observer stations, lie in the small South Dakota part of the Basin of the Red River of the North.

Temperature data in the basin of the Red River of the North above Grand Forks, November 1, 1896, to April 30, 1897.

MONTHLY MAXIMUM AND MINIMUM TEMPERATURES.

State and place.	1896.								1897.			
	November.				December.				January.			
	Maximum.	Date.	Minimum.	Date.	Maximum.	Date.	Minimum.	Date.	Maximum.	Date.	Minimum.	Date.
Minnesota:												
Ada	38	2	−35	30	39	31	−35	1	34	1	−35	26
Beardsley[a]	42	16	−26	29	48	11	−20	1, 2	40	8	−27	26
Campbell	......	......	......	......	......	......	......	......	37	1	−31	24
Crookston	36	2	−30	29	39	9	−32	1	37	1	−31	26
Detroit City	......	......	......	......	44	29	−40	1	45	8, 9	−43	26
Fergus Falls	37	16	−23	30	40	31	−25	1	40	1	−29	26
Lambert	37	1	−33	29, 30	42	31	−34	1	40	1	−35	24
Moorhead	32	2, 3	−26	29	41	9, 10	−27	1	37	1	−28	24, 25, 26
North Dakota:												
Amenia	32	2	−29	29	37	11	−31	2	38	7	−31	24
Buxton	33	2	−27	30	36	9	−28	1	37	8	−30	24
Fargo	33	2	−32	29	41	9	−33	1	35	8	−33	26, 27
Forman	37	1	−28	30	50	9	−28	1	41	1	−28	24
Gallatin	33	1	−30	29	40	10	−33	1	38	8	−36	24, 26
Larimore[a]	......	......	......	......	......	......	......	......	36	8, 9	−31	24
Mayville	35	3	−24	30	45	9	−24	1	39	7	−28	24
Power	34	4	−24	30	37	11	−23	2	38	8	−33	24
Sheyenne	34	2	−25	29	42	10	−28	1	35	8	−32	24
University[a]	41	2	−25	30	42	10	−27	1	37	1, 8	−30	24
Valley City	30	2	−17	......	38	9	−11	30	33	8	−27	24
Wahpeton	39	15	−25	30	45	28	−22	1	38	1, 8	−29	25, 27

State and place.	1897.											
	February.				March.				April.			
	Maximum.	Date.	Minimum.	Date.	Maximum.	Date.	Minimum.	Date.	Maximum.	Date.	Minimum.	Date.
Minnesota:												
Ada	33	12	−39	26	52	31	−37	15	88	27	+13	19
Beardsley[a]	36	16	−24	26	48	31	−35	14	90	27	+17	19
Campbell	32	3, 4, 12, 13, 16, 17, 19, 20	−35	26	56	31	−35	15	89	27	+15	19
Crookston	32	4	−37	26	49	30, 31	−35	15	75	27	+14	19
Detroit City	42	4	−46	26	59	31	−43	15	86	28	+11	19
Fergus Falls	33	3, 19, 20	−30	26	53	30, 31	−31	14, 15	86	27	+15	19
Lambert	38	5	−39	26	50	29	−34	14	80	27	+11	19
Moorhead	33	20	−30	26	54	31	−32	15	90	27	+16	19
North Dakota:												
Amenia	32	3	−33	27	44	30	−34	14, 15	85	27	+16	19
Buxton	34	4	−30	28	44	30	−29	14, 15	74	27	+14	19
Fargo	31	3, 16, 19	−34	26	52	31	−37	15	83	......	+ 7	2
Forman	36	16	−30	26	47	30	−34	15	89	27	+10	19
Gallatin	31	3	−40	26	45	29	−44	15	77	27	+12	19
Larimore[a]	33	4	−31	28	53	4	−30	14	72	27	+14	18
Mayville	42	4	......	......	46	30	−27	14	78	27	+11	18
Power	32	20	−39	26	52	20	−38	15	93	27	+15	19
Sheyenne	32	16	−32	26	43	31	−39	15	75	17	+14	19
University[a]	34	3, 4, 5	−30	26	50	30	−28	15	70	27	+13	19
Valley City	28	3, 19	−29	26	42	31	−33	14	78	27	+16	19
Wahpeton	38	16	−33	26	52	30	−33	15	92	27	+17	19

[a] Outside of, but near the border of the basin.

Temperature data in the basin of the Red River of the North, above Grand Forks, November 1, 1896, to April 30, 1897—Continued.

NUMBER OF DAYS THAT THE "DAILY MEAN" TEMPERATURE WAS ABOVE 32° F.

State and place.	1896.		1897.					
	November.	December.	January.	February.	March.	Dates.	April.	Dates.
Minnesota:								
Ada	0	0	1	0	......	....	29	1 to 30, excepting 19.
Beardsley[a]	0	3	0	0	6	17, 19, 28, 29, 30, 31	29	Do.
Campbell	......	......	0	0	6	17, 19, 28, 29, 30, 31	.....	
Crookston	1	0	0	0	6	18, 19, 28, 29, 30, 31	29	Do.
Detroit City	......	1	0	1	7	17, 18, 19, 28, 29, 30, 31	27	1 to 30, excepting 8, 19, 20.
Fergus Falls	2	0	0	0	7	17, 18, 19, 28, 29, 30, 31	.....	
Lambert	0	0	0	1	7	17, 18, 19, 28, 29, 30, 31	29	1 to 30, excepting 19.
Moorhead	0	2	0	0	6	17, 19, 28, 29, 30, 31	29	Do.
North Dakota:								
Amenia	0	0	0	0	5	19, 28, 29, 30, 31	28	1 to 30, excepting 6, 19.
Buxton	0	0	0	0	5	19, 28, 29, 30, 31	25	1 to 30, excepting 2, 5, 6, 7, 19.
Fargo	0	0	0	0	1	29	26	1 to 30, excepting 1, 2, 6, 19.
Forman	0	1	0	0	6	17, 19, 28, 29, 30, 31	30	1 to 30.
Gallatin	0	0	0	0	5	17, 28, 29, 30, 31	27	1 to 30, excepting 1, 6, 19.
Larimore[a]	......	......	0	0	3	19, 30, 31	23	1 to 30, excepting 1, 2, 5, 6, 7, 18, 28.
Mayville	0	3	0	0	5	18, 28, 29, 30, 31	26	1 to 30, excepting 1, 5, 18, 19.
Power	0	0	0	0	3	29, 30, 31	29	1 to 30, excepting 19.
Sheyenne	0	0	0	0	3	29, 30, 31	27	1 to 30, excepting 6, 8, 19
University[a]	0	1	0	0	6	17, 19, 28, 29, 30, 31	28	1 to 30, excepting 6, 19.
Valley City	0	0	0	0	3	29, 30, 31	27	1 to 30, excepting 9, 18, 19.
Wahpeton	1	4	0	0	8	17, 18, 19, 27, 28, 29, 30, 31	30	1 to 30.

[a] Outside of, but near the border of the basin.

NOTE.—None of the regular Weather Bureau stations nor the voluntary observer stations lie in the small South Dakota part of the basin of the Red River of the North.

Conjectural flood table, Red River of the North, 1897, at Grand Forks, N. Dak.

[Prepared from observed gauge readings and measured cross section with estimated velocities.]

Date.	Gauge reading.		Run-off (total for 24 hours).	Total flow.	Flow per square mile of water-shed.	Excess flow over capacity of channel at bank full stage (35 feet).		
	6 a. m.	6 p. m.				Daily increment.	Rate of increment.	Total increment.
			Cubic feet.	*Cubic feet per second.*	*Cubic feet per second.*	*Cubic feet.* ±	*Cubic feet per second.* ±	*Cubic feet per second.*
March 31[a]	4.8	4.8	269,400,000	3,120	0.13	....	....	....
April 1	5.4	5.9	363,026,000	4,202	.17	....	....	....
April 2	7.7	9.0	518,400,000	6,000	.24	....	....	....
April 3	13.0	16.1	628,800,000	6,150	.26	....	....	....
April 4	21.1	24.0	1,469,340,000	17,006	.70	....	....	....
April 5	28.0	30.5	2,090,880,000	24,202	.99	....	....	....
April 6	34.0	36.1	3,961,828,800	45,855	1.87	+ 193,752,000	+ 2,242	193,752,000
April 7	38.2	39.8	4,641,796,800	53,712	2.20	+ 873,720,000	+10,112	1,067,472,000
April 8	41.4	42.7	5,213,181,600	60,338	2.47	+1,445,104,800	+16,725	2,512,576,800
April 9	44.4	44.7	5,593,104,000	64,735	2.65	+1,852,027,200	+21,435	4,337,604,000
April 10	45.2	[b]45.2	5,678,791,200	65,727	2.69	+1,910,714,400	+22,115	6,248,318,400
April 11	45.0	44.9	5,628,354,400	65,143	2.67	+1,860,277,600	+21,531	8,108,596,000
April 12	44.7	44.25	5,490,244,800	63,544	2.60	+1,722,168,000	+19,932	9,830,764,000
April 13	43.75	43.3	5,312,390,400	61,486	2.52	+1,544,313,600	+17,873	11,375,077,600
April 14	43.0	42.25	5,127,040,800	59,572	2.43	+1,358,964,000	+15,729	12,734,041,600
April 15	42.0	41.5	4,960,901,600	57,417	2.35	+1,192,824,800	+13,806	13,926,866,400
April 16	41.0	40.25	4,827,467,200	55,873	2.29	+1,059,390,400	+12,262	14,986,256,800
April 17	40.2	39.75	4,640,349,600	53,707	2.25	+ 872,272,800	+10,095	15,858,529,600
April 18	39.45	39.0	4,500,187,200	52,086	2.13	+ 732,110,400	+ 8,474	16,590,640,000
April 19	38.75	38.5	4,390,351,200	50,814	2.06	+ 622,274,400	+ 7,202	17,212,914,400
April 20	38.1	37.7	4,254,660,000	49,244	2.02	+ 486,583,200	+ 5,632	17,699,497,600
April 21	37.4	37.0	4,119,508,800	47,679	1.95	+ 351,432,000	+ 4,067	18,050,929,600
April 22	36.55	36.3	3,990,492,000	46,186	1.89	+ 222,415,200	+ 2,575	18,273,344,800
April 23	36.0	35.7	3,884,241,600	44,957	1.84	+ 116,164,800	+ 1,344	18,389,509,600
April 24	35.3	35.0	3,760,754,400	43,527	1.78	− 7,322,400	− 85	(c)
April 25	34.55	34.15	3,617,762,400	41,872	1.72	− 150,314,400	− 1,739	
April 26	33.8	33.4	3,479,090,400	40,627	1.65	− 288,986,400	− 3,345	
April 27	32.9	32.4	3,304,260,000	38,244	1.57	− 463,816,800	− 5,368	
April 28	31.75	31.1	3,096,036,000	35,834	1.47	− 672,040,800	− 7,776	
April 29	30.55	29.7	2,868,393,600	33,199	1.36	− 899,683,200	−10,413	
April 30	29.0	28.3	2,624,659,200	30,378	1.24	−1,143,417,600	−13,234	
May 1	27.35	26.7	2,360,275,200	27,318	1.12	−1,407,801,600	−16,924	
May 2	25.5	24.8	2,088,871,200	24,292	.99	−1,679,205,600	−19,435	
May 3	23.7	22.9	1,832,556,800	21,210	.87	−1,935,520,000	−22,402	
May 4	21.8	21.2	1,606,348,800	18,592	.76	−2,161,738,000	−25,020	
May 5	20.2	19.65	1,418,407,200	16,417	.67	−2,349,669,600	−27,195	
May 6	18.9	18.4	1,292,824,800	14,963	.62	−2,475,252,000	−28,649	
May 7	17.7	17.25	1,180,418,400	13,662	.56	−2,587,658,400	−29,949	
May 8	16.75	16.3	1,089,309,600	12,608	.52	−2,678,667,200	−31,003	
May 9	15.8	15.4	1,007,424,000	11,660	.48	−2,760,652,800	−31,952	
May 10	15.0	14.7	949,838,400	10,993	.45	−2,818,238,400	−32,619	
May 11	14.2	13.8	883,764,800	10,200	.42	−2,884,312,000	−33,383	
May 12	13.4	13.1	836,698,000	8,927	.39	−2,931,378,800	−33,928	
May 13	12.6	12.2	771,349,600	8,478	.37	−2,997,727,200	−34,696	
May 14	11.7	11.3	732,477,600	7,498	.35	−3,035,599,200	−35,134	
May 15	10.8	10.4	647,848,000	6,823	.31	−3,120,228,800	−36,114	
May 16	9.8	9.5	589,485,600	....	.28	−3,178,519,200	−36,789	

[a] No record immediately preceding March 31, when the river was already near the 5-foot stage, ordinary low water at Grand Forks being about + 0.5 and extreme low water − 1.5 on the Grand Forks gauge.

[b] Gauge 45.3 at 3 p. m. Crest of flood.

[c] Remaining capacity of channel below bank full stage (35 feet on gauge.)

The only continuous and reliable record of the 1897 freshet is the gauge reading at Grand Forks, taken twice each day during the entire period of the flood. In the accompanying table I have attempted to show approximately the hydrological conditions at Grand Forks, using the observed gauge reading and the measured cross section of the river channel with an estimated mean velocity. This is nothing better than conjecture in the absence of flood measurements, but the results check fairly well with accepted flood formulæ. More or less injury will result to bottom lands with a moderate rise of Red River, but the danger line at which the river is generally out of its banks is assumed at 35 on the Grand Forks gauge. In the freshet of 1897 the river stood above the danger line, or out of its banks, for eighteen days, and during this time the total excess of flow above bank-full capacity appears to have been approximately 18,000,000,000 cubic feet. Before and after this period the flow of the river was carried off below the danger line, or between its banks. The total excess above the capacity of the river during the period above the danger line was approximately 21 per cent of the total flow during the same time.

Certain reservoir sites are available for the storage of flood water in the Red River basin. They are shown upon the map herewith and have tributary drainage areas, and areas of drainage which may be made tributary to them, approximately as follows:

	Square miles.
Red Lake	2,000
Lake Traverse	1,200
Area which may be made tributary to Lake Traverse	1,100
Otter Tail Lake	950
Total of these drainage subareas	5,200

Including the above the Red River basin at Grand Forks aggregates 24,400 square miles, so that the area tributary to possible reservoirs is about 21 per cent of the total area of the river basin above Grand Forks, while the excess flood above the bank-full capacity of the Red River at Grand Forks was in 1897 about 21 per cent of the total flow of Red River during the eighteen days of such excess. If this surplus of 18,000,000,000 cubic feet from the crest of the flood wave could have been intercepted and impounded in reservoirs at the critical time of the flood, the river would not have risen above the danger line at Grand Forks upon that occasion. Supposing the flood to have been moving equally from the entire basin at the time of reaching the danger line at Grand Forks, the aggregate flood excess would have emanated from the areas of a possible reservoir system.

Assuming an uniform distribution of melting snow, an uniform flow from the entire basin depends upon whether during the period of flood preceding the danger stage at Grand Forks the natural capacity for storage in the reservoir areas was practically exhausted and of little effect upon the outflow from these areas; upon whether the capacity of the outlets and the distance and the slope of channel were such as to bring this outflow to Grand Forks from each area when the river rose above the danger line. Unfortunately there is little more than tradition and conjecture to determine the possibility of such a contingency. The maximum rate of flood flow said to have been observed heretofore from the areas of a possible reservoir system is:

	Cubic feet per second.
From Red Lake (in Red Lake River near Thief River Falls)	7,000
From Traverse and Otter Tail Lakes, and the area which may be made tributary to Lake Traverse (in Red River at Breckenridge)	20,000

The aggregate flow from these areas has never been measured, and no record can be found of estimates predicated upon observation. The maximum rate of flow at Grand Forks in the flood of 1897 occurred April 10, and is estimated at 66,000 cubic feet per second, an excess of approximately 22,000 cubic feet per second above bank-full capacity of the Red River at that point.

In this flood of 1897 the active cause, the melting of the snow, was probably equally operative over all the basin above Grand Forks, and the supply of snow appears to have been distributed with tolerable uniformity. Seven days of the process of melting were required to raise the Red River at Grand Forks above the danger line (35 feet). During this period of seven days there was opportunity for minor pondage in the tributaries and partial filling of the several lakes which have been proposed as reservoirs. It may perhaps be said that the concentric shape of the river basin relative to Grand Forks, the steep slope of the tributaries from reservoir areas and the traditional outflow from these, favor the possibility of a large contribution from the reservoir areas.

Immediately preceding the early spring flood the lakes will have their winter level. In the flood of 1897, when the thaw commenced, they began to fill. They filled only to their natural flood level, and could retain each not more than its capacity between mean low and natural flood stages. These several capacities are approximately as follows:

Name of lake proposed as reservoir.	Capacity in cubic feet between mean low and natural flood stages (approximate).	Area of drainage.
		Sq. miles.
Red Lake	20,300,000,000	2,000
Otter Tail Lake	2,200,000,000	950
Lake Traverse	4,200,000,000	1,200

Because of their limited capacity in proportion to drainage area, it would appear that floods are rather to be expected from Traverse and Otter Tail than from Red Lake. From the latter they would come only when the lake happened to be at flood stage in freshet season, which might perhaps happen through the choking of the outlet with sand. At high stages Red Lake overflows its border into the surrounding swamp, making the outlet indeterminate in extent and the overflow difficult to estimate; the water may find its way in part into the Clear Water River. This lake has an elevation of about 394 feet above low water at Grand Forks and its outlet, Red Lake River, reaches Grand Forks with a length in the general direction of its valley of about 100 miles, increased perhaps to 200 by the bends of the river.

Otter Tail River has its source in a small lake about 235 feet above and 60 miles distant from Otter Tail Lake, which the river reaches through a series of smaller lakes. Otter Tail Lake is about 372 feet above the mouth of the Otter Tail River at Breckenridge, which is only 55 miles from the lake. There is perhaps a fall of 5 feet per mile as the river runs from Otter Tail Lake to the Red River at Breckenridge.

At high stages Lake Traverse overflows to the south into Big Stone Lake, joining in part the Minnesota River drainage. This lake has an elevation of about 25 feet above the Red River at Breckenridge, which is about 27 miles distant, where its outlet, the Bois des Sioux, joins the Otter Tail to form the Red River. The former river is frequently dry in the summer season. Nothing is known of its condition in flood except that it seems to overflow the prairie on either side.

In the Red River Basin flood conditions are quite distinct from conditions of average flow in ordinary years. In the one case there may be uniformity of active causes operating to produce like effects throughout the drainage basin; in the other, the average flow of ordinary years, the conditions of flow are strikingly dissimilar.

If these lakes were required to store above their natural flood stage, during the period of overflow of Red River at Grand Forks, a theoretical inflow proportional to their relative drainage areas and aggregating the total excess of 18,000,000,000 cubic feet at Grand Forks during the overflow period, and to be at the same time adapted to the storage of the annual run-off for the benefit of navigation, the relative conditions must be somewhat as follows:

	Name of lake proposed as reservoir.		
	Red Lake.	Otter Tail Lake.	Lake Traverse.
Range between low and high water in natural condition (approximate.)	1½	3	6
Average total annual run-off as determined by observation and estimate which would be stored from mean low water upward.....cubic feet..	30,000,000,000	8,000,000,000	[a] 5,000,000,000
Proportional quantity of flood water to be stored above mean natural flood stage.....cubic feet..	6,918,000,000	3,119,000,000	[a] 7,963,000,000
Approximate capacity in each foot of lift near the natural flood stage.....cubic feet..	13,500,000,000	1,030,000,000	920,000,000
Corresponding elevation of lake surface above mean natural flood stage required:			
For storage of the average annual run-off...feet..	+0.72	+4.76	−0.5
For storage of floods.....do...	+0.51	+3.03	+8.65

[a] Estimated to include area which may be made tributary to Lake Traverse.

By lowering the outlet Red Lake may be readily adapted to storing the annual run-off without raising the level of the lake above natural mean high water. It will then be capable of storing the above proportion of flood water. Otter Tail Lake must be raised about 5 feet above natural mean flood level to store the observed annual run-off, and will then be capable of storing the above proportion of flood water. Lake Traverse would not need to be raised above natural mean flood stage to store the estimated average annual run-off which now flows to this lake and that which can be diverted to it. To store a flood flow as above it would be practicable, at very considerable cost and with much local opposition, to raise the natural flood level of Lake Traverse about 5 feet, storing about five-ninths of this flood water, say 4,500,000,000 cubic feet. The remainder would flow into Big Stone Lake, say 3,500,000,000 cubic feet. Big Stone Lake has a drainage area of about 1,200 square miles, of which the lake occupies at mean low water about 18.3 square miles. It lies in the basin of the Minnesota River and is fed from the Dakota prairies. With a drainage area one-third greater than that of Otter Tail it gives an observed average annual run-off of about 1,000,000,000 cubic feet, while Otter Tail Lake gives about 8,000,000,000.

It is practicable, as in the case of Lake Traverse, to raise the natural flood level of this lake, at very considerable cost and with much local opposition, about 12 feet, giving it a common flood level with Traverse and affording storage for about 6,000,000,000 cubit feet above the natural flood stage of the lake. Although the average annual run-off of Big Stone Lake differs so widely from that of Otter Tail, flood conditions are similar for all these lakes, and Big Stone may receive from its own area the same proportion of flood in the same time, say 4,000,000,000 cubic feet. This, with the overflow from Traverse, will exceed the storage capacity of Big Stone by about 500,000,000 cubic feet, and the surplus must be discharged into the Minnesota River. Estimating from mean low water, the joint storage capacity of Traverse and Big Stone so united would then be about 17,600,000,000 cubic feet. This is perhaps three times the average annual run-off available for storage for the benefit of navigation.

Such a combination of these two lakes would unite the two at high water at a common level. Under natural conditions the mean low water level of the two lakes differs by about 8 feet, the mean low water of Traverse being about the mean high water of Big Stone. In times of flood vessels of light draft have passed freely between them. Raising the flood level for storage as herein indicated, however, would practically extinguish the settlement of Browns Valley on the low divide now separating these lakes. Land damages would be excessive and local opposition insurmountable. Any considerable elevation of either Big Stone, Traverse, or Otter Tail Lake will meet with strong local opposition. The cost of such a reservoir in Traverse and Big Stone would be prohibitory.

In the foregoing the flood duty of the reservoirs is predicated upon the hypothesis of a flow from each subarea of the Red River Basin above Grand Forks proportional to its relative area of drainage, and a natural flood stage in each reservoir at the critical time of the flood at Grand Forks. The latter assumption is a safe one, but the former is ideal. Inequality of flow is far more probable and a higher or lower flood duty may be imposed upon either or any of these reservoirs with corresponding failure to impound the flood water advantageously. In any event, capacity for the storage of the annual run-off for the benefit of navigation may afford a very large measure of relief from excessive floods, because such capacity will be sufficient for the ordinary flood duty of the Red Lake and the Otter Tail Lake reservoirs owing to the occurrence of floods in the spring when the reservoirs are low; and because the deep trough-like character of the Red River channel, with banks increasing progressively in height from 12 to 50 feet and with little bottom land below the banks, permits the river to carry off a large volume of water, notwithstanding its moderate average slope of about 6 inches per mile, before the flood tops the banks and spreads over the plain. It seems hardly practicable to make any more definite statement, without flood measurements covering several floods and necessarily extending over many years, to take the place of tradition and conjecture, upon the Red River and its principal tributaries.

The injury resulting to various interests from the freshet of 1897 is graphically presented in the accompanying extract from a memorial of the Tri-State Drainage Association of Minnesota, North and South Dakota. I have no means of verifying the estimate of damages, which is certainly very large. Available records show that freshets in the Red River exceeding 35 feet on the gauge at Grand Forks have occurred in 1873, 1882, 1883, 1893, and 1897, giving intervals of nine, one, ten, and four years. During such intervals reservoirs constructed only to mitigate the effect of excessive floods would be idle capital; but applied to the storage of the annual run-off for a low-water supply they would be in constant use. From the latter point of view they are separately considered hereinafter; and for consideration in connection therewith the accompanying data for the upper Mississippi reservoirs is submitted. The State of Minnesota has for many years been engaged in creating a comprehensive system of drainage in the Red River Basin, and the United States Geological Survey is now investigating the question of irrigation of this basin. The one will supplement the other. No reservoir system should be planned without due regard to the former—to assist when practicable; whether the latter is in harmony with any plan for conservation of water for purposes of navigation with incidental relief from floods remains to be determined by the investigation of the Geological Survey.

Irrigation will need the same reservoirs with their incidental mitigation of floods; the water used in irrigation will return to the river channel excepting loss in plant life and evaporation. Should these several utilities be found to be harmonious and possible at reasonable cost, the raison d' être of the reservoirs will be quadrupled.

It will be noted in the memorandum herewith of legislation upon the subject-matter of the present surveys, that preliminary examinations were required by the acts of September 19, 1890, August 17, 1894, and June 3, 1896; that reports thereon were submitted with opinions and recommendations, and printed in executive documents and in the annual reports of the Chief of Engineers; and that the acts of March 3, 1899, and June 13, 1902, under which the present report is submitted, require no further preliminary examinations, and, inferentially, no further expression of opinion.

RED LAKE AND RED LAKE RIVER, MINNESOTA.

The river and harbor act approved March 3, 1899, appropriated $5,000 for "a survey of Red Lake and Red Lake River, Minnesota, with a view to the construction of a dam with locks at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North and said Red Lake River, Minnesota, and estimating the cost of said improvement." In the river and harbor act approved June 13, 1902, it is expressly directed that this survey be continued "with a view to the construction of a dam at the outlet of said lake for the purpose of improving the navigation of the Red River of the North and said Red Lake River, Minnesota." It is assumed that these acts contemplate the utilization of Red Lake as a reservoir for storage of surplus water, to be released during periods of low water in these rivers, the incidental mitigation of injurious floods, and provision for continuance of navigation between Red Lake River and Red Lake when the latter is dammed for use as a reservoir.

Navigation of Red Lake River is restricted at present to two sections, the one between the mouth of the river and Fishers Landing, 40 miles above, and the other between Thief River Falls and Red Lake, a distance of about 100 miles, the latter being farther extended about 50 miles by Red Lake. These two sections are separated by a portion of Red Lake River which can only be improved by a system of slackwater navigation not contemplated by the act of March 3, 1899.

The portion of Red River affected by the contemplated improvement is necessarily below the junction with Red Lake River at Grand Forks. At this point it has an extreme range of 46 feet between low and high water, the mean low water corresponding to a gauge reading of +0.5 foot, and a flow of 964 cubic feet per second, giving at least 4 feet in depth at any point between Grand Forks and Pembina, with the assistance of dredging, which, if properly maintained, will cost about

$7,500 per annum. The river is not artificially obstructed, and three steamboats are now employed in its navigation. The lowest stage of water corresponds to a flow of 200 cubic feet per second above the junction of Red Lake River, and requires, for a navigable stage below the junction, with systematic dredging, a contribution from Red Lake River of 800 cubic feet per second. Improvement heretofore has consisted in dredging and in removing bowlders and other obstructions.

The lower section of Red Lake River has about the same extreme range, with a least flow of 200 cubic feet per second and a flood flow estimated at 15,000 cubic feet per second. It is obstructed by bridges, and there is not at present any navigation upon it. The upper section of Red Lake River in the vicinity of Thief River Falls is believed to have an extreme range of about 10 feet, with a least flow of 250 cubic feet per second and a flood flow of perhaps 7,000 cubic feet per second. It is not obstructed artificially, and eight steamboats are engaged in the navigation of this part of the river and of Red Lake. The improvement of the river has been restricted to the removal of natural obstructions. With the existing plant a least depth of 2 feet at mean low water can be maintained by an annual expenditure of $2,400.

Red Lake has an area of nearly 500 square miles, or about one-fourth of its own drainage area, including the surface of the lake. The water of the lake has an extreme range of about 3 feet, escaping, at the higher elevation, into the marsh which borders the outlet. On the north and west this marsh extends indefinitely toward the Canada line, with a well-marked divide, where explored, 10 feet above the lake level, separating the drainage of the latter from that of Rainy Lake.

The general level of this swamp at the border of the lake, from which it is separated by a low sand ridge, corresponding with the ordinary high water of the lake surface, appears to limit the possible reservoir capacity of the lake to the present level of high water. This great swamp is comparatively unexplored, and the area draining toward Red Lake is a matter of conjecture, while the height of the divide above the lake surface is known only at one point, where it was crossed by a railroad survey. It is evident, however, that to overflow this swamp for reservoir purposes would be to increase the surface exposed to evaporation out of all reasonable proportion to the depth of water stored. On the other hand, by dredging the outlet of the lake so as to lower the low-water limit increased capacity can be given advantageously without increasing the surface exposed to evaporation.

The work of the survey comprised the instrumental examination of the southwest corner of Red Lake at the outlet, as shown on map herewith, the survey of Red Lake River from the Red Lake to Thief River Falls, and of a line connecting this river with the Clearwater River, and gauging the flow of Red Lake River for a period of twenty-eight months, as shown in the accompanying table. During this period about 70,000,000,000 cubic feet of water passed the gauging station, an average of 2,500,000,000 per month. During the same period the rainfall in Red Lake Basin was about 71 inches, which, however, is above the average for a number of years. The rainfall during the six months preceding the gaugings was about 4.7 inches. It was found to be desirable to establish the gauging station about 100 miles below the lake outlet, so that the run-off is from a somewhat larger area than is tributary to the lake, but no tributary stream of any size enters the river in this distance. On the other hand, the formation at the lake is sand and gravel over clay, and the river flows through about 20 miles of surrounding swamp. Some part of the measured flow in the river is the underflow from lake and swamp, which would not appear at the lake outlet.

Within limits of reasonable cost the lake may be utilized as a reservoir to a depth of 4 feet, provision being made by dredging for an outlet of sufficient capacity at the lowest stage. Within this range of 4 feet the lake will store about 55,000,000,000 cubic feet. Supposing the reservoir to have been at its mean level on May 1, 1899, when hydrological observations were commenced; that an outflow had been permitted, giving at the gauging station 1,000 cubic feet per second during the one hundred and eighty-four days of navigation, and 200 cubic feet per second during the one hundred and eighty-one days when navigation is closed; neglecting possible difference in evaporation due to storage in the lake, as well as the distance of gauging station from the lake outlet, there would have been stored at the close of the first twelve months a surplus of 3,229,530,100 cubic feet. At the end of the next twelve months this would have been increased to 18,167,488,300 cubic feet, and at the close of the period of hydrological observations, four months later, the surplus accumulation would have been 19,122,381,100 cubic feet, equivalent to 1.37 feet in depth. During this period the extreme height of the lake would have been about 3.45 feet above extreme low water, or within 0.55 foot of the highest permissible level. The records of rainfall available appear to indicate that this period was one of considerably more than the average precipitation. It is to be expected that seasons of equal or greater rainfall or outflow will occur, but the reservoir will provide storage for the surplus of wet seasons to tide over the inevitable years of drought.

In the construction of the dam, the sluices should be adapted to an outflow of 1,000 cubic feet per second, the bottom of the sluices to be 4 feet below the contemplated lowest water surface of the lake. To provide for navigation between lake and river, a lock is proposed 150 feet by 50 feet in the clear, which will accommodate any steamboat now upon either river or the lake. The sill of the lock is 4 feet below extreme low water, and the lock and dam are so located as to avoid exposure to wave action.

The outlet channel to be dredged, in order to make available the increased depth of storage, involves a considerable excavation. The very moderate fall obtainable necessitates a waterway of large capacity to deliver the amount of 1,000 cubic feet per second, about 800 square feet of sectional area, the bottom of the channel being about 4 feet below the present bottom at the outlet of the lake. The extension of this channel into the lake, which is necessary, may require maintenance. If a tendency should develop to fill up with sand, through wave action, it will be necessary to provide some inexpensive protecting works or resort to dredging. For the outlet channel below the dam the small and practically uniform velocity of current with constant volume and the absence of sediment appear to give reasonable assurance of permanence.

The location of lock and dam is chosen at some distance from the lake outlet in order to avoid exposure to wave action of easterly storms over a 25-mile reach of lake surface. The lowering of the outlet obviates the necessity for dikes, giving all storage below the natural high-water level of the lake, estops all claims for damages due to flowage, renders unnecessary in this case the expensive cadastral surveys which have been required in the case of the Mississippi reservoirs for the adjudication of such damages, and would be of great benefit as a part of the system of drainage in which the State of Minnesota is so deeply interested. The cost is estimated as follows:

Lock and dam	$65, 000. 00
Dredging outlet, 902,283 cubic yards, at 20 cents	180, 456. 60
Dredge and working plant	25, 000. 00
Total	270, 456. 60
Cost per square mile of drainage area	135. 26
Cost per million cubic feet capacity	13. 53

The benefit to navigation to be derived from the improvement may be inferred from the following table:

Red River at Grand Forks.

Gauge reading.	Flow per second.	Depth in channel below Grand Forks.		Average duration during each season of navigation.[a]
		With dredging.	Without dredging.	
Feet.	*Cubic feet.*	*Feet.*	*Feet.*	*Days.*
−2 to −1	500 to 850	3 to 4	1 to 2	5
−1 to 0	850 to 1,275	4 to 5	2 to 3	16
0 to +1	1,275 to 1,800	5 to 6	3 to 4	34
+1 to +2	1,800 to 2,400	6 to 7	4 to 5	35
+2 to +3	2,400 to 3,000	7 to 8	5 to 6	19

[a] Mean of thirteen years (1890–1902).

To maintain a 4-foot stage without dredging with this reservoir alone would require during say fifty-five days a flow from the reservoir exceeding 1,000 cubic feet per second, with proportional diminution of this flow during the remaining one hundred and twenty-nine days of navigation.

At mean low water Red Lake River has a flow of 500 cubic feet per second. If this were increased to 1,000 cubic feet per second, the depth out on the bars of Red Lake River would be increased about 12 inches. The following tables give more detailed information:

Red Lake Survey—Table of hydrological observations, May, 1899, to August, 1901, inclusive.

Month.	Run-off.	Required for navigation.	Surplus.	Aggregate to be stored.	Increase in elevation of lake.
1899.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Feet.*
May	2, 572, 796, 700	2, 678, 400, 000	− 105, 603, 300	− 105, 603, 300	− .008
June	2, 953, 722, 200	2, 592, 000, 000	+ 361, 722, 200	+ 256, 118, 900	+ .018
July	3, 151, 008, 000	2, 678, 400, 000	+ 472, 608, 000	+ 728, 726, 900	+ .052
August	2, 039, 990, 400	2, 678, 400, 000	− 638, 409, 600	+ 90, 317, 300	+ .006
September	1, 942, 444, 800	2, 592, 000, 000	− 649, 555, 200	− 559, 237, 900	− .040
October	1, 921, 968, 000	2, 678, 400, 000	− 756, 432, 000	− 1, 315, 669, 900	− .094
November	1, 378, 512, 000	518, 400, 000	+ 860. 112, 000	− 455, 557, 900	− .032
December	1, 275, 264, 000	535, 680, 000	+ 739, 584, 000	+ 284, 026, 100	+ .020

Red Lake Survey—Table of hydrological observations, etc.—Continued.

Month.	Run-off.	Required for navigation.	Surplus.	Aggregate to be stored.	Increase in elevation of lake.
1900.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Feet.*
January	1,181,088,000	535,680,000	+ 645,408,000	+ 929,434,100	+ .066
February	1,085,616,000	483,840,000	+ 601,776,000	+ 1,531,210,100	+ .109
March	1,174,176,000	535,680,000	+ 638,496,000	+ 2,169,706,100	+ .156
April	1,578,224,000	518,400,000	+1,059,824,000	+ 3,229,530,100	+ .232
May	1,087,344,000	2,678,400,000	−1,591,056,000	+ 1,638,474,100	+ .117
June	1,176,336,000	2,592,000,000	−1,415,664,000	+ 222,810,100	+ .016
July	1,131,840,000	2,678,400,000	−1,546,560,000	− 1,323,749,900	− .095
August	2,744,236,800	2,678,400,000	+ 65,836,800	− 1,257,913,100	− .090
September	4,492,972,800	2,592,000,000	+1,900,972,800	+ 643,059,700	+ .046
October	5,311,931,200	2,678,400,000	+2,633,531,200	+ 3,276,590,900	+ .235
November	3,783,024,000	518,400,000	+3,264,624,000	+ 6,541,214,900	+ .469
December	2,683,324,800	535,680,000	+2,147,644,800	+ 8,688,859,700	+ .623
1901.					
January	2,083,536,000	535,680,000	+1,547,856,000	+10,236,715,700	+ .734
February	1,871,195,000	483,840,000	+1,387,355,000	+11,624,070,700	+ .833
March	2,141,683,200	535,680,000	+1,606,003,200	+13,230,073,900	+ .949
April	5,455,814,400	518,400,000	+4,937,414,400	+18,167,488,300	+1.303
May	4,054,320,000	2,678,400,000	+1,375,920,000	+19,543,408,300	+1.402
June	3,320,006,400	2,592,000,000	+ 728,006,400	+20,271,414,700	+1.454
July	1,131,840,000	2,678,400,000	−1,546,560,000	+18,724,854,700	+1.343
August	3,075,926,400	2,678,400,000	+ 397,526,400	+19,122,381,100	+1.371

Season of navigation assumed to be May 1 to October 31. Area of lake taken at 500 square miles.

Table of rainfall in the vicinity of Red Lake, Minn., 1891 to 1901.

[Mean at the following stations: Ada, Minn., 1892 to 1901; Bemidji, Minn., 1896 to 1901; Crookston, Minn., 1891 to 1901; Hallock, Minn., 1899 to 1901; Lake Winnibigoshish dam, Minn., 1891 to 1901; Leech Lake dam, Minn., 1891 to 1901; New Folden, Minn., 1898 to 1901; Thief River Falls, Minn., 1899 to 1901. Area of watershed, including surface of lake, 1,930 square miles.]

Month.	Average.	Maximum.		Minimum.		Total precipitation in Red Lake Basin.		
		Amount.	Year.	Amount.	Year.	Year.	Depth.	Quantity.
	Inches.	*Inches.*		*Inches.*			*Inches.*	*Cubic feet.*
January	0.619	1.23	1897	0.17	1898	1891	16.621	[a]74,525,737,651
February	.591	1.75	1897	.17	1899	1892	19.930	87,433,632,000
March	1.200	2.34	1894	.11	1895	1893	23.112	103,629,030,912
April	2.203	4.49	1896	.89	1897	1894	21.834	97,898,765,184
May	2.992	7.55	1896	.77	1897	1895	23.143	103,785,066,316
June	4.150	[b]7.50	1895	1.33	1900	1896	29.418	131,903,722,368
July	4.150	[c]8.15	1897	.76	1894	1897	24.397	107,793,561,427
August	3.358	[d]7.20	1900	1.29	1894	1898	23.443	105,114,057,523
September	2.520	[e]7.57	1900	.91	1897	1899	26.173	117,354,766,003
October	1.910	3.91	1894	.17	1892	1900	27.796	124,629,244,186
November	.816	1.89	1896	.22	1897	1901	30.577	137,101,315,507
December	.538	1.31	1891	.13	1892			

[a] July to December (inclusive) only.
[b] 10.37, Leech Lake, 1901.
[c] 12.08, New Folden, 1901.
[d] 10.63, Winnibigoshish, 1900.
[e] 15.30, Hallock, 1900.

OTTER TAIL LAKE AND OTTER TAIL RIVER.

The river and harbor act approved March 3, 1899, appropriated "for making a survey of Otter Tail Lake and Otter Tail River, Minnesota, with a view to the construction of a dam at the outlet of said lake, for the purpose of improving the navigation on the Red River of the North, Minnesota, and estimating the cost of said improvement, three thousand dollars." The river and harbor act approved June 13, 1902, directs the continuance of this survey "with a view to the construction of a dam at the outlet of said lake for the purpose of improving the navigation on the Red River of the North, Minnesota," the cost to be defrayed from the general appropriation for surveys, etc., made by this act.

Otter Tail Lake is the last and the largest of the long series of lakes in which the Red River of the North, locally known as Otter Tail River, has its source. The drainage area of the lake is about 940 square miles, a large proportion of which is water surface or swamp. The whole area is a good natural holding ground and assures a fairly uniform flow of water below Otter Tail Lake during all seasons of the year. In the dry season this area, with the basin of the Pelican just below, is the main source of supply for the Red River down to Grand Forks, where the Red Lake River comes in.

Surveys have been made as contemplated by the acts above referred to with hydrological observations covering the period from May, 1899, to June, 1903. During this period the average annual run-off has been about 8,000,000,000 cubic feet, all of which may be readily impounded in Otter Tail Lake and adjoining lesser lakes and ponds by the construction of a dam of moderate height at the outlet of Otter Tail Lake. There are no engineering difficulties, but the question of land damages is a serious one. The low lands bordering this lake above the level of the swamps are grass lands and especially valuable as such, it is said, because grass can not be grown with advantage upon the light sandy soil of the higher grounds. Farmers express the opinion that the value of this grass land is the value of the farm attached to it, because the farm would be of little value without it. If this extreme view should prevail with a jury of condemnation, land damages would be excessive. An attempt on the part of private interests in Fergus Falls to raise the level of Otter Tail Lake about 2 feet met with strenuous opposition, and the dam constructed for this purpose was recently destroyed with dynamite.

The Otter Tail River has a rapid fall from the lake to the Breckenridge Flats below Fergus Falls, where it first becomes navigable. At Fergus Falls the river is utilized for water power. It is assumed that the minimum flow to be continuously maintained for this and other uses is the least observed natural flow (February, 1901), 140 cubic feet per second, and that only the surplus over this minimum will be available for storage during the season of suspension of navigation on the Red River. The run-off determined by the observations of the last four years will, if stored, give this minimum flow while navigation is suspended, and an average flow of 338 cubic feet per second during the season of navigation.

Low water in the reservoir must be that elevation at which a flow of 338 cubic feet per second is assured, and the lowering of the outlet as far as practicable is necessary to reduce this elevation and provide for storage of the available run-off with the least height of dam and least flowage of surrounding lands. The area of Otter Tail Lake is about 23 square miles. As the level of the water surface rises in the proposed reservoir, other lakes and ponds and low bordering land are occupied until at a 6-foot stage above mean low water, or 3 feet above natural flood level of Otter Tail Lake, the water surface has an area of about 48 square miles.

The storage of the observed annual run-off of 8,000,000,000 cubic feet would require an elevation of water surface of about 7 feet above mean low water, and the storage of floods perhaps 5 feet above mean low water, or 2 feet above natural flood stage of Otter Tail Lake; but the demands of riparian owners immediately below Otter Tail Lake for a continuous minimum flow will limit the actual accumulation of water in the reservoir from the annual run-off to a maximum of about 3,000,000,000 cubic feet. This will give an extreme elevation of water surface of about 3 feet above mean low water, and will require a dam at the outlet, say, 4 feet higher. The flowage elevation should be established upon this basis, bordering land below the flowage elevation condemned for right of flowage, and land 4 feet above it awarded damages for injurious effect of such elevation of water surface and for possible overflow at long intervals. The height proposed for the dam is sufficient to permit the impounding to such extent as may be necessary of any flood of which there is any reliable record.

The estimated cost is as follows:

Cadastral surveys	$5,000.00
Dam with sluices	18,500.00
Embankments	4,000.00
Land damages, 718 acres below flowage level	23,595.00
Land damages, 700 acres between flowage level and 4 feet above	7,000.00
Total	58,095.00
Cost per square mile of drainage area	61.15
Cost per million cubic feet of annual run-off	7.26

The least flow of the Red River at Breckenridge is estimated at 200 cubic feet per second, all of which is from the Otter Tail River, about 60 cubic feet per second coming from the drainage area below Otter Tail Lake. The effect of increasing the supply from the lake during the season of navigation will be to increase the flow of the Red River at Breckenridge from 200 cubic feet per second to about 400 cubic feet per second, or 100 per cent. To this extent it will increase the flow of the Red River at Grand Forks where the Red Lake River comes in, and where navigation will receive the greatest benefit. The fluctuation of elevation in the proposed reservoir predicated upon the observed run-off from the lake from May, 1899, to June, 1903, is shown in the following table:

Otter Tail Lake.

Month.	Run-off.	Required for navigation, etc.	Surplus	Aggregate to be stored.	Increase in elevation of lake.	Approximate area of water surface.
1899.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Feet.*	*Square feet.*
May	636,681,600	905,309,200	-268,627,600	- 268,627,600	-0.4	634,000,000
June	1,439,277,984	876,960,000	+562,317,984	+ 293,690,384	+ .4	634,000,000
July	1,739,491,200	905,309,200	+834,182,000	+1,127,872,384	+1.4	874,000,000
August	1,289,260,800	905,309,200	+383,951,600	+1,511,823,984	+1.9	874,000,000
September	1,017,964,800	876,960,000	+141,004,800	+1,652,828,784	+2.0	1,013,000,000
October	779,068,800	905,309,200	-126,240,400	+1,526,588,384	+1.9	874,000,000
November	849,657,600	619,488,000	+230,169,600	+1,756,757,984	+2.1	1,013,000,000
December	810,000,000	374,976,000	+435,024,000	+2,191,781,984	+2.4	1,013,000,000
	8,561,402,784					
1900.						
January	629,424,000	374,976,000	+254,448,000	+2,446,229,984	+2.8	1,063,000,000
February	568,512,000	338,688,000	+229,824,000	+2,676,053,984	+3.0	1,063,000,000
March	583,113,600	374,976,000	+208,137,600	+2,884,191,584	+3.2	1,063,000,000
April	527,938,128	619,488,000	- 91,549,872	+2,792,641,712	+3.1	1,063,000,000
May	507,945,600	905,309,200	-397,463,600	+2,395,178,112	+2.7	1,063,000,000
June	347,328,000	876,960,000	-529,632,000	+1,865,546,112	+2.2	1,013,000,000
July	260,841,600	905,309,200	-644,567,600	+1,220,978,512	+1.6	874,259,379
August	354,585,600	905,309,200	-550,723,600	+ 670,254,912	+ .9	874,259,379

Otter Tail Lake—Continued.

Month.	Run-off.	Required for navigation, etc.	Surplus.	Aggregate to be stored.	Increase in elevation of lake.	Approximate area of water surface.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Feet.*	*Square feet.*
1900.						
September	402,451,200	876,960,000	−474,508,800	+195,746,112	+.3	664,000,000
October	518,140,800	905,309,000	−387,168,200	−191,422,088	−.3	664,000,000
November	531,273,600	619,488,000	−88,215,600	−279,637,688	−.4	664,000,000
December	530,323,200	374,976,000	+155,347,200	−124,290,488	−.2	664,000,000
	5,761,877,328					
1901.						
January	461,721,600	374,976,000	+86,745,600	−37,544,888	−.1	664,000,000
February	343,353,600	338,688,000	+4,665,600	−32,879,288	−.1	664,000,000
March	393,638,400	374,976,000	+18,662,400	−14,216,888	.0	664,000,000
April	519,091,200	619,488,000	−100,397,800	−114,614,088	−.2	664,000,000
May	538,617,600	905,309,200	−366,692,600	−481,307,288	−.7	664,000,000
June	593,654,400	876,960,000	−283,306,600	−764,613,888	−1.2	664,000,000
July	939,340,800	905,309,200	+34,031,600	−730,582,288	−1.1	664,000,000
August	1,059,004,800	905,309,200	+153,695,600	−576,886,688	−.9	664,000,000
September	732,412,800	876,960,000	−144,558,200	−721,444,888	−1.1	664,000,000
October	506,908,800	905,309,200	−398,400,400	−1,119,345,288	−1.8	664,000,000
November	564,019,200	619,488,000	−55,468,800	−1,175,314,088	−1.9	664,000,000
December	436,838,400	374,976,000	+61,862,400	−1,113,451,688	−1.8	664,000,000
	7,088,601,600					
1902.						
January	430,185,600	374,976,000	+55,209,600	−1,058,242,088	−1.7	664,000,000
February	347,328,000	338,688,000	+8,640,000	−1,049,602,088	−1.7	664,000,000
March	444,700,800	374,976,000	+69,724,800	−979,877,288	−1.5	664,000,000
April	376,704,000	619,488,000	−242,784,000	−1,222,661,288	−1.9	664,000,000
May	939,427,200	905,309,200	+34,118,000	−1,188,543,288	−1.8	664,000,000
June	1,582,588,800	876,960,000	+705,628,800	−482,914,488	−.7	664,000,000
July	1,386,201,600	905,309,200	+480,892,400	−2,022,088	.0	664,000,000
August	947,289,600	905,309,200	+41,980,400	+39,968,312	+.1	664,000,000
September	651,628,800	876,960,000	−225,333,200	−185,364,888	−.3	664,000,000
October	569,030,400	905,309,200	−336,278,800	−521,643,688	−.8	664,000,000
November	558,316,800	619,488,000	−61,172,200	−582,815,889	−.9	664,000,000
December	486,691,200	374,976,000	+111,715,200	−471,100,668	−.6	664,000,000
	8,720,092,800					
1903.						
January	299,721,600	374,976,000	−75,254,400	−546,355,068	−.8	664,000,000
February	236,044,800	338,688,000	−102,643,200	−648,998,269	−1.0	664,000,000
March	447,897,600	374,976,000	+72,921,600	−576,076,668	−.9	664,000,000
April	742,262,400	619,488,000	+122,774,400	−453,302,268	−.6	664,000,000
May	993,513,600	905,309,200	+88,204,400	−365,097,868	−.5	664,000,000
June	905,126,400	876,960,000	+28,166,400	−336,931,468	−.5	664,000,000
	3,624,566,400					

Total for fifty months, 33,746,540,912.
Average flow, November 15 to April 15, 140 cubic feet per second.
Average flow, April 15 to November 15, 338 cubic feet per second.

BIG STONE LAKE AND LAKE TRAVERSE, MINNESOTA AND SOUTH DAKOTA.

The river and harbor act approved March 3, 1899, appropriated "for making a further survey of Big Stone Lake and Lake Traverse, Minnesota and South Dakota, with a view to construct reservoirs therein for the improvement of the navigation of the Minnesota River, and an estimate of the cost of such improvements, $5,000." In the river and harbor act approved June 13, 1902, it is expressly directed that the survey of these two lakes be continued with a view to constructing reservoirs therein for the improvement of the navigation of the Minnesota River, the cost of continuing survey to be defrayed from the general appropriation for surveys, etc., made by the same act.

The two lakes, which are so associated for a common purpose, are contiguous, and in times of flood mingle their waters, but they are ordinarily separated by a low divide, Lake Traverse being in the Red River Basin, its outlet the Bois des Sioux River, and Big Stone Lake a part of the Minnesota River. Normally Big Stone Lake is about 8 feet below Lake Traverse. The locality is thus described by Mr. Upham in his monograph upon the glacial Lake Agassiz. (No. 25, U. S. Geol. Survey.)

> The excavation of the valley occupied by lakes Traverse and Big Stone and the Minnesota River was first explained in 1868 by Gen. G. K. Warren, who attributed it to the outflow from this ancient lake. He made a careful survey of this valley, and his maps and descriptions, with the accompanying discussion of geologic questions, are most valuable contributions to science. After his death, in commemoration of this work, the glacial river that was the outlet of Lake Agassiz was named River Warren. * * *
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> ### RIVER WARREN.
>
> The lowest point of the watershed dividing the great areas that are drained, respectively, to Hudson Bay and the Gulf of Mexico is between lakes Traverse and Big Stone, on the boundary line of Minnesota and South Dakota. Its elevation above the ocean is 975 feet. Here an ancient water course called Browns Valley, * * * which was occupied by the River Warren, outflowing from Lake Agassiz, is eroded in the thick sheet of glacial drift to a depth of 100 to 125 feet, with a width of about 1½ miles. The tops of its inclosing bluffs and the general level of the adjoining country of undulating or moderately rolling till are about 1,100 feet above the sea. Portions of this channel contain the long and narrow lakes, Traverse and Big Stone, the former outflowing by the Bois des Sioux River and the Red River of the North to Lake Winnipeg and Hudson Bay and the latter by the Minnesota River to the Mississippi. But this channel shows that subsequent to the deposition of the drift a great river has flowed here across what is now one of the principal watersheds of the continent. * * *
>
> Lakes Traverse and Big Stone are from 1 to 1½ miles wide, mainly occupying the entire area between the bases of the bluffs, which rise about 125 feet above them. Lake Traverse is 15 miles long; it is mostly less than 10 feet deep and its greatest depth probably does not reach 20 feet. Big Stone Lake is 26 miles long, and its greatest depth is reported to be from 15 to 30 feet. The portion of the channel between these lakes is widely known as Browns Valley. As we stand upon the bluffs here, looking down on these long and narrow lakes in their trough-like valley, which extends across the 5 miles between them where the basins of Hudson Bay and the Gulf of Mexico are now divided, we have nearly the scene which was presented when the melting ice sheet of British America was pouring its floods along this hollow. Then the entire extent of the valley was doubtless filled every summer by a river which covered all the present areas of flood plain, in many places occupying as great width as these lakes.
>
> General Warren observed that Lake Traverse is due to partial silting up of the channel since the outflow from the Red River Basin ceased, the Minnesota River at the south having brought in sufficient alluvium to form a dam, while Big Stone Lake is similarly referred to the sediment brought into the valley just below it by the Whetstone River.

The project outlined in the two acts of Congress above referred to, which unites these lakes in reservoirs for the benefit of the Minnesota River, would require a barrier at the northern end of Lake Traverse, a channel connecting this lake with Big Stone, and a barrier at the southern end of Big Stone Lake, with regulating works to control the flow of water between the two lakes, from Lake Traverse into the Bois des Sioux River, and from Big Stone Lake into the Minnesota River, and spillways for protection against floods.

Upon the low divide between these lakes is the town of Browns Valley, Minn., which is only a few feet above high water of Lake Traverse. The general elevation of Browns Valley ranges from 968 to 984 feet above tide, a large proportion being below 974. Drainage northward being estopped by raising the level of Lake Traverse for a reservoir, drainage southward must be provided, and this would seem to limit the permanent elevation of Big Stone Lake to about 968. Dikes would not protect the low ground if this lake were maintained at any higher elevation, because seepage would be inevitable and this land would then have no drainage. The natural flood elevation of Big Stone Lake appears to have been at times as high as 975, but such occasions must have been rare and of short continuance, though they will certainly recur.

The Minnesota River enters Browns Valley about 1 mile south of Lake Traverse and flows southward about 3½ miles to Big Stone Lake. In times of flood the river overflows its banks where it enters the valley, the water escaping partly into Lake Traverse. Low water of the Minnesota at this point has an elevation of about 980, and it falls in about 3½ miles to the low-water elevation of Big Stone Lake, about 963. It is the detritus brought down by this river, the geologists say, that constitutes the present divide between the two lakes, and the river is still at work. It must be reckoned with in any scheme for connecting the lakes, and should apparently be kept out of the scheme. It will persist in maintaining a slope of about 5 feet per mile and an elevation of 980 or more, where the outlet from Lake Traverse must be kept at least 10 feet lower.

Similarly the Whetstone River, at the south end of Big Stone Lake, the geologists say, has created this lake by pushing its detritus into the channel of the old river Warren as a barrier. It enters the Minnesota River below the lake outlet, but overflows into the lake in time of flood. Like the Minnesota, it brings down at such times large quantities of material from the Dakota hills. Like the Minnesota, too, its flood water of melting snow is nearly all there is of it, the prairies affording little summer flow, and this flood water must be turned into the reservoir. To get the water without the detritus is a troublesome problem. It would seem necessary to put the reservoir dam below the mouth of the Whetstone and take the river in as it is to resume the process of delta making.

It appears from hydrological observations covering a period of about four years that Big Stone Lake can not be expected to have an average annual run-off exceeding about 1,000,000,000 cubic feet; it is estimated that Lake Traverse may have about 2,000,000,000. Storage of this in the two lakes would give a range of about 2 feet in each lake, but the natural extreme range between low and high water due to floods is probably 12 feet in Big Stone (963 to 975) and 8 feet in Traverse (971 to 979). These elevations are not definitely ascertained. The two lakes belong to the class having a watershed which sheds water in torrents from a frozen surface in early spring and absorbs nearly all of the later rainfall. In times of flood, while discharging at the full capacity of their natural outlets, they will contain at one time about three times their average annual run-off. This happens only in flood years, which are ordinarily separated by long intervals, but the flood expectation controls the structure of the reservoir. No artificial opening in the barrier dam can give greater capacity of discharge than the natural outlet possesses. Floods in the reservoir will rise to the same and to greater heights. The elevation of the dam must exceed that of the greatest known flood, unless constructed at a cost which is prohibitory, and provision must be made in sluices and spillway for the full capacity of the natural outlet. These considerations, with safe allowance for wave action, determine the elevation of 984 for the Traverse dam and 979 for the Big Stone.

The height given to these dams is much in excess of that required for storage of water that may be usefully impounded from the watershed of the two lakes—about 3,000,000,000 cubic feet. A diversion of perhaps as much more from Otter Tail Lake is practicable, and has been suggested, making a total of, say, 6,000,000,000. Further observations are necessary to determine the quantity that can be so diverted at reasonable cost. A diversion of water from the Otter Tail River into Lake Traverse for the benefit of the Minnesota River, and indirectly the Mississippi, would, perhaps, be restricted to the surplus not required for navigation or other immediate use on the Otter Tail and Red rivers, and not capable of storage for the benefit of the latter rivers otherwise than in Lake Traverse. Both the water so diverted and the lake belong to the Red River system, but existing legislation proposes the restoration of this lake to the Mississippi Basin, and surplus water which could only be stored therein would be taken from the Red River system and transferred with the lake. It would be necessary to tap the Otter Tail below the junction of the Pelican River, before it enters the Breckenridge Flats, and convey the intercepted water by a feeder canal across Rabbit River, also intercepted, to the Mustinka River, a distance of about 24 miles. Regulating works with dam would be required in the Otter Tail and in Rabbit River.

The conveyance of the flood discharge, occurring at irregular intervals of many years and amounting to several thousand cubic feet a second, over this distance by an artificial river is manifestly out of the question. For the purpose of a tentative estimate of cost, a maximum flow of 500 cubic feet a second and permissible velocity of 3 feet per second are assumed with a cross section of canal ranging from 200 to 300 square feet. The flow in this channel would cease during the low-water months of July, August, September, and October because the water would be needed for Red River, and during this time the obstruction of the channel by vegetable growth would be active, as in the case of the extensive system of drainage ditches in this part of the State. During the winter months of November, December, January, February, and March there would be little flow because of ice. April, May, and June must furnish nearly all the water diverted. These periods will vary from year to year, but it is estimated that an average of three months' flow would be available, not exceeding 1,000,000,000 cubic feet per month.

Land damages would be determined by the storage level of water impounded for navigation, and not necessarily by the height of the dams. These will not affect the height of floods, which will be the same as at present without the dams, provided the capacity of the natural outlet is maintained in sluices and spillway, the height of the dam being for the protection of the dam, and not for the impounding of the flood. It would even appear that some retardation of flood discharge might be justifiable without giving to submerged lands a substantial basis for claim of damage. It is assumed that any other or greater servitude than that imposed by nature upon such lands, with appreciable injury therefrom, is the measure of damage, and up to the extreme elevation at which water is to be impounded and held for a definite time, the land submerged is dedicated to public use with measurable damage therefrom. If for the purpose of retarding flood discharge lands submerged by natural causes were kept in that condition a few days longer without injury or inconvenience therefrom there is public use, but hardly a measurable damage. This is a question to be decided by a jury of condemnation in the event of such use being made of these reservoirs. It is peculiar to these reservoirs, which are unique in providing storage for the average annual run-off and failing to provide for a flood. It is not considered in the estimates herewith, which are predicated upon the condemnation of land for the storage of the average annual run-off, whether from the area tributary to these two lakes or from this, with the additional area which can be made tributary to them. The storage for navigation of floods occurring at long, irregular intervals could perhaps be justified for incidental protection, but not for useful contribution of water to the river at low stages.

An important element in the project for these reservoirs, affecting the question of land damages, is the local sentiment in a number of thriving towns and in valuable farming areas bordering the lakes. The towns of Ortonville, Minn., and of Big Stone, S. Dak., are on opposite sides of Big Stone Lake, near its outlet. The lake is a summer resort, and summer visitors contribute somewhat to the prosperity of these towns and their vicinity. It is feared that the lake is drying up, and it is thought that the diversion of some of the headwaters of Red River into this lake through Lake Traverse will arrest the process, keep the lake presentable, permit local navigation upon it, and make it attractive to summer visitors. The people of this vicinity, therefore, favor the improvement of navigation on the Minnesota River through the creation of reservoirs in Big Stone Lake and Lake Traverse, and hope to be further benefited by the establishment at least of local navigation between the two lakes. They are opposed, however, to any considerable increase in the high-water elevation of the lake, or to any considerable diminution of its low-water depth, desiring as nearly as possible a uniform water level. Land damages would probably be excessive, the value of land having increased very rapidly within the last few years.

White Rock, S. Dak., is at the northern outlet of Lake Traverse, beyond the location of the dam that would be required for reservoir purposes. The town would not be injuriously affected by any change of level in the lake, but would be greatly benefited, in common with the low lands surrounding it, by the impounding of water in the lake, which would permit the regulation of the flow of the Bois des Sioux and the reclamation, by drainage, of the extensive marshes at the northern end of Lake Traverse in the vicinity of the town. The sentiment of the people around White Rock appears to favor the construction of reservoirs, but would be hostile to any impairment of natural drainage facilities. Farmers complain of backwater from the Bois des Sioux. The town of Wheaton, Minn., near by, apprehends loss of trade with South Dakota over the bridge and roadway now crossing Lake Traverse near the site of the proposed dam, by the destruction of this means of communication. This apprehension is groundless, since the dam to be constructed would replace the present roadway. The residents of Browns Valley are generally in favor of the reservoirs, though objection is made to any lowering of the level of Lake Traverse, and any change of level in either lake seriously affecting the question of drainage would be vigorously opposed. Land is held at from $25 to $75 per acre for farming purposes or pasture and town lots at very high rates. All over this section of country land is rising very rapidly in value.

The storage capacity of Big Stone Lake with a barrier dam at the necessary elevation of 979 is ample for all of the average annual run-off of this lake and of Lake Traverse, estimated at 3,000,000,000 cubic feet. If the project be limited to this, there could be no sufficient reason for linking Lake Traverse to the scheme as a reservoir, except as a receiving reservoir with a low apron across the present outlet and with a new outlet connecting Lake Traverse with Big Stone Lake, the latter having regulating works to control the flow. The cost is estimated as follows:

Barrier dam with sluices and spillway at the foot of Big Stone Lake, including diversion of Whetstone River	$139,845
Low apron across present outlet of Lake Traverse	87,352
New outlet ditch between Lake Traverse and Big Stone Lake, with regulating works	18,850
Land damages	111,910
Total (1)	357,957

If provision is made for local navigation between Lake Traverse and Big Stone Lake, as seems to be anticipated by the local interests here, the new outlet from Lake Traverse to Big Stone Lake must be a canal with a lock. Such construction of the outlet channel would increase the total cost to (2) $435,266. It has been suggested that such a reservoir with connecting canal would be a summit level on the continental divide for a practicable canal connecting the waters of the Gulf of Mexico with that of Hudson Bay. Such a canal, however, must have a capacity far below that considered profitable at the present time.

If the project be made to include the impounding of water which may be diverted into Lake Traverse from the watershed of the Otter Tail River, giving an estimated total to be impounded of about 6,000,000,000 cubic feet, Big Stone Lake can not store it all, and Lake Traverse must be utilized as a storage reservoir. This would necessitate the construction of a barrier dam at the outlet of Lake Traverse, with sluices and spillway, and the condemnation of land for flowage, together with the construction of a feeder canal from the Otter Tail to the Mustinka River. The total cost would then be (3) $1,176,972, with canal navigation between the two lakes.

SUMMARY.

	Total cost.	Cost per square mile of drainage area.	Cost per million cubic feet of stored water.
(1)	$357,957.00	$142.44	$119.32
(2)	435,266.00	173.20	145.09
(3)	1,176,972.00	257.59	196.16

The storage of 6,000,000,000 cubic feet would give to the Minnesota and to the Mississippi at St. Paul 606 cubic feet per second during the period of low water from August 1 to October 31, if a minimum flow of 50 cubic feet per second be permitted at other times. This would be an increment of 30+ per cent to the minimum summer flow of the

Mississippi at St. Paul. The effect may be inferred from the following table:

Mississippi River.

Gauge reading.	Discharge.	Increment.
	Cubic feet per sec.	*Cubic feet per sec.*
Zero [a]	2,000	....
1 foot	3,100	1,100
2 feet	4,600	1,500
3 feet	6,200	1,600
4 feet	8,100	1,900

[a] When gauge reading is zero the river channel below St. Paul has 4 feet depth for navigation.

The minimum flow of the Minnesota River is 280 cubic feet per second. The reservoir flow would increase this by 606 cubic feet.

Very respectfully, your obedient servant,

R. L. HOXIE,
Major, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[Third indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,
Chicago, Ill., September 15, 1903.

Respectfully forwarded to the Chief of Engineers.

This report is a statement of facts, and a discussion of all the information now available, relating to the effect of reservoirs at Red Lake, Otter Tail Lake, and Lake Traverse, including Big Stone Lake, both in the control of floods and in the improvement of navigation in the Red River of the North. The effect of a reservoir in Lake Traverse and Big Stone Lake on the navigation of the Minnesota River is also discussed. Few opinions are given and no recommendations are made, it being left to each reader to draw his own conclusions.

The first 15 pages are devoted to a discussion of flood control, a subject not mentioned in the law, but one incidental to reservoirs built for navigation purposes and of great local interest. The physical data available for this discussion are defective, but seem to be sufficient to demonstrate that it is impossible to construct reservoirs capable of controlling the greatest floods without inflicting serious damage upon other interests.

In the case of Lake Traverse and Big Stone Lake it is stated that "land damages would be excessive and local opposition insurmountable," and "the cost would be prohibitory." The question whether complete control is practicable at any cost, even if other interests be ignored, is still open. To answer that question with certainty it will be necessary to make further prolonged and costly observations extending over many years. That reservoirs designed to store surplus water for the benefit of navigation may afford some relief from excessive floods seems probable, but the degree of mitigation can not now be given. In the absence of specific instructions from Congress the inquiry need not be pursued further.

At the outlet of Red Lake a lock and dam can be constructed, of which the cost is estimated at $270,456.60, by which the low-water depth in Red Lake River can be increased from 2 feet to 3 feet, and the present low-water depth in the Red River of the North, 4 feet, can be maintained without dredging. As it costs $2,400 per annum to maintain the 2 feet in the first-named stream, and $7,500 to maintain the 4-foot depth in the second by dredging, the reservoir at this place would seem to be a good investment. It is recommended for favorable consideration.

A dam can be constructed at the outlet of Otter Tail Lake at an estimated cost of $58,095, by means of which the low-water flow of the Red River above its junction with the Red Lake River can be increased from 200 to 400 cubic feet per second. What the present depth is, and what the increased depth would be, do not appear, but manifestly they would, in both cases, be small. There is at present no navigation upon this part of the river. It is obstructed by a great number of fixed bridges, there being 15 or 20 of them below Fargo alone, besides a large number between Fargo and Breckenridge. The increase of flow would, of course, be added to the navigable part of the Red River below, but the present necessities of that part of the stream will be sufficiently provided for by the Red Lake reservoir. The proposed dam at Otter Tail Lake is not recommended.

Several schemes and estimates are submitted for works at Big Stone Lake and Lake Traverse for the improvement of the navigation of the Minnesota River. The first, estimated to cost $357,957, will store all of the average annual run-off, and will increase the low-water flow of the Minnesota River about 300 cubic feet per second, the present minimum flow being 280 cubic feet per second. What the present depth is, and what the increased depth would be, do not appear, but manifestly both would be small. It is understood that no navigation of any kind now exists. The second scheme is the same as the first, with the addition of a canal with lock between Lake Traverse and Big Stone Lake, and is estimated to cost $435,266. The third scheme contemplates diverting into Lake Traverse and Big Stone Lake from Otter Tail River a quantity of water about equal to the present average annual run-off of those lakes. It is estimated to cost $1,176,972. It would add 606 cubic feet per second to the low-water flow of the Minnesota River and of the Mississippi at St. Paul, increasing the depth of the latter about 6 inches. Its effect toward creating a navigation in the Minnesota, which does not now exist, would probably be inappreciable.

No one of these schemes for reservoirs at Big Stone Lake and Lake Traverse is to be commended.

O. H. ERNST,
Colonel, Corps of Engineers,
Division Engineer, Northwest Division.

[Fourth indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
September 17, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By command of Brig. Gen. Gillespie:

H. F. HODGES,
Major, Corps of Engineers.

[Fifth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 4, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

The river and harbor act of June 13, 1902, provided for certain surveys, as follows:

> Otter Tail Lake and Otter Tail River, Minnesota: Continuing survey with a view to the construction of a dam at the outlet of said lake; for the purpose of improving the navigation on the Red River of the North, Minnesota.
>
> Red Lake and Red Lake River, Minnesota: Continuing survey with a view to the construction of a dam with locks at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North and the said Red Lake River, Minnesota.
>
> Big Stone Lake and Lake Traverse, Minnesota and South Dakota: Continuing survey with a view to constructing reservoirs therein for the improvement of the navigation of the Minnesota River.

These several subjects are intimately connected, and all of them are covered by the within report of the district officer, which, with the indorsement of the division engineer, has been reviewed by the Board of Engineers for Rivers and Harbors.

The great cost of protection of the Red River Valley against excessive floods, which are infrequent, forbids the undertaking of the control of such floods, except as it may be incidental to a system of reservoirs designed for the benefit of navigation.

Otter Tail Lake and Otter Tail River.—The drainage area of the lake is about 940 square miles. This area is the main source of supply during dry seasons for Red River down to Grand Forks, where Red Lake River comes in. Allowing for a sufficient continuous flow to meet the demands of riparian owners below the lake, there is an available supply from annual run-off of about 3,000,000,000 cubic feet. This supply is sufficient to increase the flow of Red River at Breckenridge from 200 to 400 cubic foot-seconds. The estimate of land damages is uncertain. Red River is much obstructed by bridges in the upper portion, and the benefit to this section of river to result from the proposed improvement would not be commensurate with the cost.

Red Lake and Red Lake River.—At present navigation on Red Lake River is confined to a section between Thief River Falls and Red Lake, a distance of about 100 miles. On this section and on the lake 8 steamboats are operated. The lower 40 miles of the river is susceptible of improvement, but is at present obstructed by a number of bridges. These two sections are separated by a reach which can only be improved by locks and dams. A channel of 2 feet in depth is being maintained in the navigable section by dredging at a cost of $2,400 per annum. The portion of Red River affected by the proposed improvement is below Grand Forks, is unobstructed artificially and is at present navigated by 3 steamboats. A mean low-water depth of 4 feet is being maintained by dredging at a cost of $7,500 annually. A lock and dam can be constructed at the outlet of Red Lake at an estimated cost of $270,456.60, by which the low-water depth in Red Lake River can be increased to 3 feet, and the low-water depth of 4 feet in the Red River of the North can be maintained without dredging. It would appear therefore that the proposed improvement might be expected to effect a saving to the United States of about $9,900 annually. The cost of maintenance and operation for the first ten years at least would, it is thought, fall below $3,500 annually. Ignoring incidental benefits, including the mitigation of floods, but having in view the superior and more reliable channel that will be provided by the work proposed, it is believed that the interests of navigation alone will experience advantages more than commensurate with the cost of the proposed improvement.

Lake Traverse and Big Stone Lake.—These two lakes belong to a class having a watershed which sheds water in torrents from a frozen surface in the early spring, but absorbs nearly all of the later rainfall. In times of flood, while discharging at the full capacity of their natural outlets, they will contain at one time about three times their average annual run-off. This happens only in flood years, which are ordinarily separated by long intervals; but the flood expectation controls the structure of the reservoir. The elevation of the dam must exceed that of the greatest known flood unless constructed of masonry at a cost which is prohibitory, and provision must be made in sluices and spillway for the full capacity of the natural outlet. Under these circumstances the cost of construction of reservoirs in these lakes for the benefit of navigation in the Minnesota River, estimated at $357,957 to $1,176,972, would not be justified by the present or prospective commerce of the Minnesota River nor by any incidental benefits to be derived by the Mississippi at its junction with the Minnesota.

The district officer in this report has considered the various suggestions and recommendations heretofore made, but has construed the act of June 13, 1902, to require no further recommendations. The tenor of the report, however, is in harmony with the recommendations of the division engineer and with the conclusions of the Board, which are as follows:

(*a*) The construction of a dam with locks at the outlet of Red Lake for the purpose of improving the navigation of the Red River of the North and the Red Lake River, Minnesota, in the manner outlined by the district officer, at an estimated cost of $270,456.60, is recommended as desirable.

(*b*) The construction of a dam at the outlet of Otter Tail Lake for the purpose of improving the navigation on the Red River of the North is not recommended as desirable.

(*c*) The construction of reservoirs in Big Stone Lake and Lake Traverse, Minnesota and South Dakota, for the improvement of the navigation of the Minnesota River is not recommended as desirable.

For the Board:

Chas. J. Allen,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

APPENDIX A.

Upper Mississippi reservoirs constructed for the improvement of low-water navigation, the incidental mitigation of flood conditions within their effective range, and to facilitate logging.

Name of reservoir.	Drainage area (square miles).	Proportion of area of Mississippi River basin at St. Paul.	Storage capacity (million cubic feet).	Original cost, exclusive of land damages.		
				Total.[a]	Per square mile of drainage area.	Per million cubic feet capacity.
		Per cent.				
Lake Winnibigoshish	1,442	4	45,000	$216,390	$150	$5.03
Leech Lake	1,163	3.2	33,000	172,912	140	5.24
Sandy Lake	421.5	1.2	3,200	[b] 114,000	270	35.62
Pine River	562	1.5	7,500	97,000	170	12.93
Pokegama Falls	660	1.8	4,700	85,000	129	18.08
Total, completed reservoirs	4,248.5	11.7	93,400	685,302		
Gull Lake:						
Low dam[c]	287	.8	2,750	85,000	296	30.92
High dam[d]	3,094	8.6	11,898	1,200,000	387	101.00

Watershed area above St. Paul, Minn., including Minnesota River..........square miles..	36,081
Watershed area of Minnesota River..........do....	16,350
Watershed of Mississippi River above Minneapolis..........do....	19,731
Aggregate reservoir drainage area about 12 per cent of Mississippi River basin at St. Paul.	
Aggregate reservoir drainage area about 21½ per cent of Mississippi River basin at Minneapolis.	
Completed reservoirs	5
Average original cost	$137,060.00
Average cost per square mile of drainage area	$171.80
Average cost per million cubic-feet capacity	$15.38

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[a] These dams were originally constructed of timber and were perishable. They have been partially replaced with concrete and steel, and it is estimated that the total additional cost upon this account will be about $613,000. Land damages have been paid to Chippewa Indians—$150,000; land damages when paid in full will probably add the further sum of $75,000.

[b] Including cost of navigable pass

[c] Project in abeyance, no appropriation. The United States holds right of flowage over about 15,000 acres of bordering land. Cost is estimated.

[d] Including the diversion of Crow Wing River.

NOTE.—In order to impound 35,000,000,000 cubic feet of water for irrigation and incidentally to improve navigation at the first cataract of the Nile, the Egyptian Government has recently expended about $10,000,000 in the construction of the Assouan dam and sacrificed the sensibilities of antiquarians by the resulting partial submergence of the island and temple of Philæ.

APPENDIX B.

LETTER OF THE TRI-STATE DRAINAGE ASSOCIATION OF MINNESOTA AND NORTH AND SOUTH DAKOTA.

MIDLAND CANAL COMPANY,
White Rock, S. Dak., June 27, 1902.

DEAR SIR: The river and harbor bill, as it was passed, on page 143, provides that you may cause surveys to be made as detailed on page 143, items Nos. 173–184 and 175.

These items were introduced into the river and harbor bill at the instance of an association known as the Tri-State Drainage Association, which was formed in the year 1900 and which had a large membership from the States of Minnesota and North and South Dakota.

This association has for its object the conservation of flood waters in the Red River Valley, for the purpose of improving navigation in the Red River of the North and of the Minnesota River, which will also indirectly affect the stages of the water in the Mississippi River.

I can furnish you with a pamphlet setting out the whole matter in a clear and concise manner.

I have, as the secretary of the association, devoted much time to this work, have been in correspondence and consultation with Government engineers, United States Senators, Representatives, and national committeemen. It was directly the result of our efforts that the three clauses above described were introduced in the river and harbor bill.

Now we are advised by persons in high authority that, in order to have our project carried out in anything like the manner for which we have labored for the last two or three years, it is advisable to call your attention to the matter by extensive petitions and resolutions, and that they be strong. It seems to me that if the whole matter be stated plainly you would give us reasonable attention and that our work would be accomplished just as well. It is a fact that by devoting sufficient time we can furnish petitions and resolutions of the very strongest character from nearly the whole people residing in the Red River Valley and from nearly all the influential politicians and Government officials in the three States mentioned, namely, Minnesota, North and South Dakota. Senator Knute Nelson, Senator Hansbrough, Senator McCumber, Senator Kittredge are all familiar with our project and I believe will take pleasure in furnishing any information necessary on the subject.

I take the liberty to inclose a pamphlet which explains the matter quite fully. I shall be greatly pleased to hear from you upon the subject if you can possibly find the time to give us any attention whatever. Thanking you in advance, I am,

Very truly yours,

SECRETARY TRI-STATE DRAINAGE ASSOCIATION,
MINNESOTA, NORTH AND SOUTH DAKOTA.

Hon. ELIHU ROOT,
Secretary of War.

MEMORIAL OF THE TRI-STATE DRAINAGE ASSOCIATION OF MINNESOTA AND NORTH AND SOUTH DAKOTA.

* * * * * * *

Immediately following the flood which occurred in 1897, statistics of the damages were collected by the Hon. J. L. Cashel, of Grafton, N. Dak. Senator Cashel says:

"The length of the territory in the United States bordering on the Red River of the North from the foot of Lake Traverse to the international boundary line, and from the foot of Red Lake to Grand Forks, bordering on Red Lake River is about 235 miles. The average width of the overflow on the west side of the Red River and the south side of Red Lake River is 2½ miles, and on the east side of the Red River and the north side of Red Lake River it is 4½ miles, making a total width of 7 miles.

"In the lower valley, to my own knowledge, the flood was 12 miles wide, but I make a conservative estimate for the whole distance of 7 miles, a total area of 1,645 square miles, which is 1,052,800 square acres of land overflowed. Assuming for convenience of illustration that all of these lands were sown to wheat, and that under ordinary conditions they would yield 15 bushels per acre, there would be 10,991,000 bushels, which, at 50 cents per bushel, would be worth $5,495,500.

"From my own experience, on summer-fallowed land and other lands in good state of cultivation, the yield was reduced about two-thirds during the season of the flood, caused by lands being wet, packed, baked, and a deposit of foul and noxious weeds. I place the loss at 50 per cent of above amount, or 7½ bushels per acre, which is equivalent to $2,747,750 on grain alone. It required the same labor and expense for plowing, seeding, seed, cutting, and about the same in threshing for half a crop that it would for an average one.

"The yield for at least two years following was materially reduced, caused by the condition the land was left in after the flood, including the continued growth of foul weeds. I place the reduction in the yield the second year at 15 per cent, and the third year at 10 per cent, making a total of 25 per cent loss for the second and third years, which is equal to $1,373,875. The loss for the three seasons on grain alone would be $4,121,625. Allow 10 per cent saved from threshing and hauling, equal to $412,162, there would be a net loss on grain alone by one flood of $3,709,463.

"The lands overflowed, with the danger of recurrence of the same at any time, are reduced in value on an average of $2.50 per acre, or $2,632,000.

"The loss to personal property, buildings, live stock, feed, machinery, etc., to say nothing of the danger to human lives, will easily aggregate $500 to the square mile, including the loss to cities and the country, making $822,500. The loss, then, for one flood will sum up as follows:

Loss to crops	$3,709,463
Loss in personal property	822,500
Depreciation in land values	2,632,000
Total	7,163,963

"This does not include the inconvenience, hardships, danger, and expenses to settlers in moving, caring for their stock and other chattels, nor the spread of noxious weeds to the adjacent lands."

INDIVIDUAL LOSSES.

The Hon. George A. McCrea, cashier First National Bank, of Drayton, N. Dak., who was mayor of Drayton in 1897, has furnished the following detailed statement of losses and casualties sustained by the farming community surrounding Drayton. Mr. McCrea has resided at Drayton for the past twenty-three years; was chairman of the relief committee in 1897; had charge of the distribution of the United States Government funds, so that he had personal knowledge of the situation:

"The city of Drayton is situated about halfway between Grand Forks, N. Dak., and the United States boundary on the north. * * *

"The foregoing is only a partial list of losses sustained by farmers in the country tributary to Drayton and Bowesmont. The above-described condition of affairs existed along the river from Grand Forks to Winnipeg, in Manitoba, Canada. In many instances stock was saved by being driven off after the water had risen to considerable height. The storm was exceptionally bad on Easter Sunday, the wind, blowing a terrific gale, raised the water about 2 feet on the level, the waves dashing many feet high. Immediately after the storm on Easter Sunday the Red River Navigation Company furnished our committee one of their steamers. It traveled over the country from Grand Forks to Pembina, the northern boundary of the United States, furnishing the needy with provisions and rescuing many families and a large amount of live stock from drowning. The Senators and Representatives from our State were appealed to, and by their efforts the Government responded in a liberal manner.

"After a lapse of four years it is impossible for me to recall all of the details. At the time of the flood it seemed that the future of the Red River Valley depended on there being some means adopted to prevent floods. The fact of the land being subject to overflow has prevented the construction of substantial buildings."

City of Fargo, Executive Office,
Fargo, N. Dak., November 19, 1901.

Dr. R. C. Kelsey, *White Rock, S. Dak.*

Dear Sir: In reply to your favor of the 16th instant, inquiring what were the results of the overflow of the Red River of the North in April, 1897, I beg to say: That in the city of Fargo we had nearly 2 miles of paved streets destroyed. Our sewers were undermined to such an extent that many of them had to be taken up and relaid. Many buildings were carried away by the water and hundreds damaged. The cost to the city in repaving and reconstruction of sewers was about $20,000. The individual losses would be hard to determine; it would run into a large sum. The country from here southwest and north, in North Dakota, was one vast lake as far north as the international boundary and beyond. The same may be said about the condition of the land on the Minnesota side of the river. During the extreme high water I was not out of the city, having all and more than I could attend to here, but from conversations I have had with reliable men who live in all directions from here I am satisfied that the loss in North Dakota alone amounted to millions of dollars. Had the water been even 5 feet lower than it was, no damage to amount to anything would have resulted.

If Congress saw fit to assist us, as recommended by the engineers of the United States Army, we would in the future be relieved of much of the loss and anxiety. I understand that the engineers estimate that they could hold back from 15 to 20 per cent of the water. If that can be done the question of future damage would be small.

Yours, truly,

J. A. Johnson,
Mayor of Fargo from 1896 to the present time.

The following are extracts from the Grand Forks Herald of April, 1897, detailing something of the actual conditions which prevailed:

"Fargo, April 2, 1897.—The water continues to rise at the rate of about 3 inches per hour, and is going beyond all previous records; the inhabitants of the flats have been driven out of their homes. The worst of the flood is over at Wahpeton, but all of the streams are bank full and pouring great volumes of water into the Red. The Great Northern had a bad washout again west of Barnesville to-day; the Great Northern has a washout at Casselton and another at Glyndon. Reports from the Sheyenne country report the biggest flood on record in that section."

"Glyndon, Minn., April 2.—Train No. 3 on the Northern Pacific, which left Minneapolis at 8.40 Tuesday evening, is still here with little prospects of moving. About a thousand feet of track is washed out between here and Moorhead, and since the train arrived serious washouts have occurred to the east, hemming it in completely. High water has flooded many of the farms and loss of stock is reported, also loss of considerable grain in bins."

"Crookston, April 2, 1897.—The blockade of the train service between here and Minneapolis is complete. No mail has arrived during the past three days; water is over the tracks and in many places long stretches are entirely gone. The Great Northern has large forces at work on three lines between Crookston and Barnesville, but the track is under water for miles below Ada and Halstad. The St. Vincent line is just beginning to suffer, and train service was suspended to-day. The Northern Pacific has not had a train through, and a serious washout is reported at Fertile. Red Lake River has not risen dangerously yet."

"Barnesville, Minn., April 2.—The most serious washout of the flood so far occurred this morning a few miles west soon after the passage of two special Northern Pacific trains loaded with Dunkards from Indiana. The Great Northern trains, containing nearly two thousand more Dunkards, have since arrived and are consequently detained here indefinitely."

"Fargo, April 5.—The flood situation at Fargo has become very serious. Immense damage has been done by the rising waters which yesterday passed the 1882 high-water mark by several feet; a large part of the city is inundated, a great amount of merchandise is ruined, and many of the best buildings of the city are damaged by the flood. The hotels and other steam-heated buildings are without fires and the city waterworks are shut off. A gorge about 4 miles long just above the city seriously threatens all of the bridges. The big warehouse which threatened the bridges was set on fire Sunday night to prevent it striking the bridges. While burning fiercely it started downstream, and for a time the excitement was intense, as the wagon bridge narrowly escaped burning. About seven blocks of the new pavement, over half a mile in length, are completely ruined by the flood, and a great quantity of cedar blocks are now sailing down the river."

"Grand Forks, April 6.—The flood situation is becoming acutely interesting. For the past forty-eight hours the Red River has been making the liveliest record in the way of a flood within the memory of man, rising at an average rate of nearly 4 inches an hour. Less than one week ago the river was at its normal low-water stage; at 4 o'clock this morning it had reached the mark of 33.5 feet. Some time to-morrow it is expected to pass the record point, 44.6 feet of 1882. Yesterday most of the houses on the flat south of the Great Northern bridge were nearly all submerged, some of them floating and others capsized. Passengers on the trains from the south last night state that for a large share of the distance between Fargo and this city there is very little land in sight, vast lakes of ice extending as far as the eye can see in either direction."

The water at Grand Forks continued to rise until it reached 48 feet above low-water mark; every basement in the city was flooded; every furnace fire extinguished, and almost all business came to a standstill; a considerable amount of paving was washed away; the bridges were badly damaged. From up and down the river came stories of loss and suffering. Thousands of acres of land were rendered unfit for crops.

APPENDIX C.

MEMORANDUM OF RIVER AND HARBOR LEGISLATION PERTAINING TO THE SURVEY AND RESURVEY OF RED LAKE AND RED LAKE RIVER, OTTER TAIL LAKE AND OTTER TAIL RIVER, AND BIG STONE LAKE AND LAKE TRAVERSE, WITH A VIEW TO THE CONSTRUCTION OF RESERVOIRS FOR THE IMPROVEMENT OF NAVIGATION, AND OF REPORTS THEREON.

RIVER AND HARBOR ACT OF SEPTEMBER 19, 1890.

SEC. 17. That the Secretary of War is hereby directed, at his discretion, to cause examinations or surveys, or both, to be made and the estimated cost of improvement to be submitted at the following localities, to wit:

* * * * * * *

Red River and tributaries above Fergus Falls and Crookston, and of Big Stone Lake, with a view to improving navigation thereon by the erection of suitable dams, or by such other means as may be deemed best, together with an estimate of the cost.

(See H. Doc. No. 127, 52d Cong., 1st sess.; Annual Report Chief of Engineers for 1892, Pt. 2, p. 1853.)

RIVER AND HARBOR ACT OF AUGUST 18, 1894.

SEC. 10. That the Secretary of War is hereby directed to cause preliminary examinations to be made at the following localities, to wit: * * *

Big Stone Lake, with a view to construction of reservoirs.

* * * * * * *

Red Lake River, with the view of improving Red Lake River from Thief River Falls to the Red Lake.

(See H. Doc. No. 256, 53d Cong., 3d sess.; Annual Report Chief of Engineers for 1895, Pt. 3, p. 2208.)

RIVER AND HARBOR ACT OF JUNE 3, 1896.

SEC. 8. That the Secretary of War is hereby directed to cause preliminary examinations to be made at the following localities, to wit: * * *

Otter Tail Lake and Otter Tail River, with a view to the construction of a dam at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North.

Red Lake and Red Lake River, with a view to the construction of a dam with locks at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North and said Red Lake River. * * *

SEC. 9. That the Secretary of War is hereby directed, at his discretion, to cause surveys to be made and the cost of improvement to be estimated at the following localities, to wit:

* * * * * * *

Big Stone Lake and Lake Traverse, with a view to the construction of reservoirs, in accordance with the report of Maj. W. A. Jones, of the Engineer Corps of the United States Army, dated January 16, 1895.

(See H. Docs. Nos. 325 and 306, 54th Cong., 2d sess.; Annual Report Chief of Engineers for 1897, Pt. 3, pp. 2172–2173; H. Doc. No. 134, 55th Cong., 2d sess.; Annual Report Chief of Engineers for 1898, Pt. 3, p. 1835.)

RIVER AND HARBOR ACT OF MARCH 3, 1899.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums of money be, and are hereby, appropriated, to be paid out of any money in the Treasury not otherwise appropriated, to be immediately available, and to be expended under the direction of the Secretary of War and the supervision of the Chief of Engineers, for the construction, completion, repair, and preservation of the public works hereinafter named: * * *

For making a survey of Red Lake and Red Lake River, Minnesota, with a view to the construction of a dam with locks at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North and said Red Lake River, Minnesota, and estimating the cost of said improvement, five thousand dollars.

For making a survey of Otter Tail Lake and Otter Tail River, Minnesota, with a view to the construction of a dam at the outlet of said lake, for the purpose of improving the navigation on the Red River of the North, Minnesota, and estimating the cost of said improvement, three thousand dollars.

For making a further survey of Big Stone Lake and Lake Traverse, Minnesota and South Dakota, with a view to construct reservoirs therein for the improvement of the navigation of the Minnesota River, and an estimate of the cost of such improvements, five thousand dollars.

(See H. Docs. Nos. 671, 672, and 675, 56th Cong., 1st sess.; Annual Report of the Chief of Engineers for 1900, Pt. 4, pp. 2828 to 2836, inclusive.)

RIVER AND HARBOR ACT OF JUNE 13, 1902.

SEC. 14. That the Secretary of War is hereby directed to cause preliminary examinations or surveys to be made at the localities named in this section as hereinafter provided. In all cases, unless a survey or estimate is herein expressly directed, a preliminary examination shall first be made, which shall embrace information concerning the commercial importance, present and prospective, of the river or harbor mentioned, and a report as to the advisability of its improvement. Whenever such preliminary examination has been made, in case such improvement is not deemed advisable, no survey thereof or estimate therefor shall be made without the direction of Congress; but in case the report shall be to the effect that such river or harbor is worthy of improvement the Secretary of War is hereby directed, at his discretion, to cause surveys to be made and the cost of improving such river or harbor to be estimated and to be reported to Congress: *Provided*, That in all cases preliminary examinations, as well as surveys, provided for in this act shall be examined and reviewed by the board provided for in section three of this act, to wit: * * *

Otter Tail Lake and Otter Tail River, Minnesota: Continuing survey with a view to the construction of a dam at the outlet of said lake, for the purpose of improving the navigation on the Red River of the North, Minnesota.

Red Lake and Red Lake River, Minnesota: Continuing survey with a view to the construction of a dam with locks at the outlet of said lake, for the purpose of improving the navigation of the Red River of the North and said Red Lake River, Minnesota.

Big Stone Lake and Lake Traverse, Minnesota and South Dakota: Continuing survey with a view to constructing reservoirs therein for the improvement of the navigation of the Minnesota River.

(See Annual Report of the Chief of Engineers for 1902, Pt. 2, pp. 1683, 1684, 1685.)

Z 9.

GAUGING MISSISSIPPI RIVER AT OR NEAR ST. PAUL, MINNESOTA.

The approved project and report of progress of the work will be found in the Report of the Chief of Engineers for 1904, Part 1, page 430.

Ninety-eight dollars and sixty-seven cents of the allotment of $500, made April 18, 1903, was expended in keeping the record of the gauges between Lock and Dam No. 2 and the mouth of the Minnesota River when the stage of the river was such as to make additional data necessary.

Money statement.

July 1, 1903, balance unexpended (allotted April 18, 1903)	$500.00
June 30, 1904, amount expended during fiscal year	98.67
Balance returned to Treasury	401.33

Summary of expenditures during fiscal year ending June 30, 1904.

Supplies	$7.35
Services	91.32
Total	98.67

ABSTRACT OF ALLOTMENTS.

For fiscal year ending June 30—	
1889	$900.00
1890	600.00
1891	900.00
1892	900.00
1893	500.00
1894	500.00
1895	500.00
1896	500.00
1897	500.00
1898	$500.00
1900	500.00
1903	500.00
1904	500.00
Total allotted	7,800.00
Returned to Treasury	1,481.27
Total expended	6,318.73

APPENDIX A A.

IMPROVEMENT OF THE MISSOURI RIVER AND OF OSAGE AND GASCONADE RIVERS, MISSOURI.

REPORT OF MAJ. H. M. CHITTENDEN, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Missouri River.
2. Osage River, Missouri and Kansas.
3. Gasconade River, Missouri.

EXAMINATIONS.

4. Kaw (Kansas) River, Kansas.
5. Missouri River, mouth to Sioux City, Iowa, including sections at and near Hermann, West Glasgow, Wilhoite Bend, Lexington, and St. Joseph, Missouri.

HARBOR LINES.

6. Missouri River at St. Joseph, Missouri.

United States Engineer Office,
Sioux City, Iowa, July 20, 1904.

General: I have the honor to submit herewith my annual reports upon the improvement of the Missouri, Osage, and Gasconade rivers for the fiscal year ending June 30, 1904.

* * * * * * *

Very respectfully,

H. M. Chittenden,
Major, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A

A A I.

IMPROVEMENT OF MISSOURI RIVER.

A condensed history of the Government work on the Missouri River will be found in the Annual Report of the Chief of Engineers for 1903, page 405.

LOWER RIVER.

Owing to the small balance available from the last appropriation (act of June 13, 1902) work during the year has been limited to maintenance and repairs. The most considerable work done at any one point was the protection, with short dikes, of 4,500 feet of bank near Chamois, Mo., which had been uncovered and exposed to the action of the river by the destruction of the Chamois bank head. The total cost of the work was $15,138.26, of which about 20 per cent was borne by private parties.

Snagging operations were carried on during a portion of the season by the snag boat *James B. McPherson*.

For detailed information upon the operations for the year, see report by Assistant Engineer W. R. De Witt.

During the great flood of 1903, which caused so much destruction in the vicinity of Kansas City, Mo., and Kans., the Government fleet was used as far as practicable to assist sufferers and remove wreckage, but it was not found that very much could be done.

Harbor lines were established January 5, 1904, for the city of St. Joseph, Mo. A Board of Engineers was appointed by Special Orders, No. 39, Office Chief of Engineers, October 31, 1903, to consider the subject of harbor lines for Kansas City, Mo., and to report upon flood conditions at the mouth of the Kaw. The harbor lines recommended by the Board are now under consideration by the War Department and approval of them is expected at an early date. The report of the Board upon flood conditions and obstructions in the Kaw River was published as Senate Document No. 160, Fifty-eighth Congress, seconp session.

Preliminary examinations required by act of June 13, 1902, were made at Hermann, West Glasgow, Wilhoite Bend, Lexington, and St. Joseph, and reports thereon were published as House Document No. 441, Fifty-eighth Congress, second session.

The several bridges in the lower Missouri district, including the Osage and Gasconade rivers, which have been or are being constructed under the supervision of this office, have recently been inspected, and the following are hereby reported as completed with reasonable conformity to the acts of Congress under which they were built:

- Missouri River:
  - Burlington and Missouri River Railroad bridge at Plattsmouth, Nebr.
  - St. Joseph and Grand Island Railroad bridge at St. Joseph, Mo.
  - Electric railway bridge at St. Charles, Mo.
- Gasconade River:
  - St. Louis, Kansas City and Colorado Railroad bridge, Gascondy, Mo.
  - Wagon bridge at Rollins Ferry, Mo.
- Osage River:
  - St. Louis, Kansas City and Colorado Railroad bridge, Hoecker, Mo.
  - Kansas City, Osceola and Southern Railroad bridge, Osceola, Mo.

The commerce of the lower river shows a falling off this year as compared with last. No regular packet plied on the river during the year. In spite, however, of the continued decline of commercial boating, public sentiment along the river, particularly from Kansas City down, is very strong that the river should be and will be utilized for freight purposes between these two points. The influence of the river upon freight rates is fully recognized by the business men of St. Louis and Kansas City, and it is not apparent why a profitable trade is not being carried on over this stretch of the river. Last season the railroads could not, or at least did not, handle freight between these points with satisfactory promptness or regularity, owing mainly to the great volume of traffic, and a good line of packets could not have failed to do a business profitable alike to itself and the public. It is believed that if such a line were organized on a conservative basis, with boats built for existing conditions on the river as ameliorated by the removal of snags and by a moderate amount of sluicing or dredging at the several "crossings," it would become a permanent feature of the commercial business between these two important centers.

Attention is invited to the accompanying statement from the Commercial Club, of Kansas City, which is believed to be of sufficient importance to justify printing as a part of this report.

UPPER RIVER.

By project approved August 1, 1902, the appropriation for work on the upper river ($100,000) was allotted as follows, to cover two seasons' operations:

For snagging	$16,000
Work at Bismarck, N. Dak	4,000
Work at Pierre, S. Dak	12,000
Work at Yankton, S. Dak	15,000
Work at Elkpoint, S. Dak	13,000
Work at Sioux City, both banks	20,000
Balance unprovided for	20,000

The only operations besides snagging during the season of 1903 consisted in repair work at Pierre, Elkpoint, and Sioux City, Iowa, and the extension of Dike No. 7, at Yankton, a distance of 1,020 feet.

Snagging was carried on from July 3 to November 21, 1903, by snagboat *Mandan.*

For details of the season's operations see report of Mr. E. D. Vincent, United States assistant engineer.

BANK PROTECTION.

During the past year about 30 petitions have been sent to this office, either directly or by reference from the Chief of Engineers, asking for protection from the ravages of the river. The condition of things in this respect along the lower river is probably more serious than is generally understood, and while relief from it is not a matter which by itself is recognized as a legitimate purpose of appropriations for improving rivers and harbors, still wherever improvement work can be so planned that, without any sacrifice of its efficiency in improving the navigable channel, it may also be utilized to save property from destruction, the consideration of protection ought to be given due weight. The history of the improvement of the river shows that the most effective works in improving the navigable channel are those which keep the banks from caving in. The greater part of the difficulty of navigating this stream arises from sand bars and snags, and both of these obstructions result in the main from the erosion of the banks. Careful observation of existing works shows, as a general rule, a good channel along stretches of the river protected by revetment. While it would naturally be desirable that the works along the river be connected as far as possible, still there is nothing to support the theory that they must be so connected in order to accomplish their purpose in improving the channel. Better results can be obtained, from the point of view of navigation alone, by holding the banks wherever the river is attacking them than by proceeding continuously from a given starting point, while the incidental gain in the protection of property will be vastly greater.

ESTIMATES FOR FUTURE WORK.

As suggested in my last annual report, unless the necessities of administration require a division of the work on the Missouri into separate districts, or unless there are large works at special localities to be separately provided for, it would be better to treat the river as a whole in making appropriations for its general improvement; and the following estimates of future work are prepared on this basis. They embrace only the repair and maintenance of existing works and the completion of those already begun at various localities. No estimate is made for other important localities where the necessity for work is urgent, for the reason that Congress has not yet authorized any work at these points.

In estimating the cost of thorough repairs of existing works, considering their long neglect and consequent deterioration, approximately 10 per cent upon the original cost has been taken. In new ravetment work the cost is estimated at $10 per linear foot of bank, and in longitudinal dike work at $20 per foot.

Repair and maintenance.

Pelican Bend, Mo	$15,000
Howard Bend, Mo	5,000
Murrays Bend to mouth of Gasconade River, Mo. (systematic improvement of First Reach)	250,000
Wilhoites Bend, Mo	15,000
Arrow Rock, Mo	5,000
Miami, Mo	10,000
Little Blue, Mo	7,500
Kansas City, Mo. and Kans	75,000
Leavenworth, Kans	30,000
Atchison, Kans	25,000
St. Joseph, Mo	100,000
Rulo, Nebr	10,000
Nebraska City, Nebr	20,000
Omaha and Council Bluffs, Nebr. and Iowa	75,000
Sioux City, Iowa	35,000
Elkpoint, S. Dak	7,500
Yankton, S. Dak	10,000
Pierre, S. Dak	15,000
Bismarck, N. Dak	12,500
Judith and Fort Benton, Mont	1,500
Total	724,000

Completion of existing works.

Howards Bend, Mo., revetment	$50,000
Murrays Bend to mouth of Gasconade River, Mo., revetment	200,000
Dam across Osage Chute, Mo	50,000
Rocheport, Mo., revetment	100,000
Wilhoites Bend, Mo., revetment	70,000
Kansas City and vicinity, Mo. and Kans., revetment	400,000
St. Joseph, Mo., revetment, and longitudinal dike	200,000
Sioux City, Iowa, revetment	50,000
Elkpoint, S. Dak., revetment	150,000
Pierre, S. Dak., revetment	100,000
Bismarck, N. Dak., longitudinal dike	100,000
Bismarck, N. Dak., revetment	100,000
Mannhaven, N. Dak., revetment	22,000
Judith and Fort Benton, Mont., revetment	10,000
Total	1,602,000

Aggregate for two years' operations.

Maintenance and repairs	$724,000
Completion of existing improvements at special localities	1,602,000
Snagging and dredging	50,000
Total	2,376,000

An estimate of $50,000 is submitted for snagging.

Only two items in the above estimate require particular explanation.

(1) The dam across Osage Chute: The Osage River, after reaching the Missouri, moves down the right bank, on the south side of Dodds Island, and joins the main stream several miles below. In its original condition a portion of the Missouri River also flowed down this chute. The Missouri River Commission undertook to force the Osage directly out into the Missouri and did a large amount of work to that end. There still remains to be done the closing of the Osage Chute. Direct connection can not be made until this is done. In its present condition the mouth of the Osage is absolutely obstructed and must remain so until this chute is closed. It is an important piece of work.

(2) The Board of Engineers, constituted by Special Orders, No. 39, Office Chief of Engineers, Washington, October 31, 1903, submitted the following report upon the protection of the East Bottoms in Kansas City from a threatened cut-off by the river:

> The flood of 1903 in the Missouri River developed a strong tendency to cut a new channel across the flats in the eastern portion of Kansas City, locally known as the East Bottoms. A strong current flowed across the bottoms, destroying portions of the high trestle and embankment of the Chicago, Milwaukee and St. Paul Railroad bridge approach and cutting a partial channel, which in several places was of considerable depth. It is probable that in the present condition an ordinary high water would complete the work. If this should take place the river would entirely flank the high bridge of the railroad, built under Government supervision to give an unobstructed channel for navigation, and would require the building of another structure. It is the opinion of the Board that measures should be taken to prevent this by advancing the bank of the river out to the harbor line and then protecting it with adequate levee. This work should extend from about opposite the foot of Brooklyn street, Kansas City, Mo., to the Milwaukee bridge. The cost is estimated at $300,000.

The balance of the estimate of $400,000 given in the table is for the extension of the Quindaro revetment and that in Kaw Bend.

(3) Longitudinal dike at Bismarck: For the rectification of the channel above the Northern Pacific bridge so as to eliminate a very dangerous piece of river in a place where there is considerable boating,

it is important to fair up the right shore line for 5,000 feet above. It is expected that if this work is done the Northern Pacific Railroad will enlarge the river section under their bridge so as to lesson the danger from ice gorges.

Money statement.

UPPER RIVER.

July 1, 1903, balance unexpended		[a] $59,649.12
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902, and April 28, 1904		2,000.00
Received from other sources		[b] 351.46
		62,000.58
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$12,125.60	
For maintenance of improvement	88,105.19	
		36,705.61
July 1, 1904, balance unexpended		25,294.97
July 1, 1904, outstanding liabilities		1,496.67
July 1, 1904, balance available		23,798.30

LOWER RIVER.

July 1, 1903, balance unexpended		$86,194.96
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902, and April 28, 1904		50,000.00
Received from other sources		[c] 729.41
		136,924.37
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$12,125.60	
For maintenance of improvement	51,399.58	
July 1, 1904, balance unexpended		73,399.19
July 1, 1904, outstanding liabilities		1,467.47
July 1, 1904, balance available		71,931.72

ENTIRE RIVER.

Amount (estimated) required for completion of existing project		Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$1,602,000.00	
For snagging	50,000.00	
For maintenance of improvement	724,000.00	
		2,376,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

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[a] Reduced $129, balance of act of September 19, 1890, covered into surplus fund.

[b] Received from sale of condemned property, $342.16, and from refundment, $9.30.

[c] Miscellaneous receipts from sale of property and material, $694.02; from refundment, $16.04; and from urgent deficiency act of February 18, 1904, $19.35.

APPROPRIATIONS AND ALLOTMENTS, EXCLUSIVE OF THOSE FOR SNAGGING, FOR IMPROVING UPPER MISSOURI RIVER.

Act of—	
August 14, 1876	$20,000.00
June 18, 1878	42,500.00
March 3, 1879	60,000.00
June 14, 1880	43,000.00
March 3, 1881	66,000.00
August 2, 1882	[a]115,000.00
July 5, 1884	140,000.00
August 5, 1886	60,000.00
August 11, 1888	200,000.00
February 22, 1890	[b]300,000.00
July 13, 1892	[c]150,000.00
August 18, 1894	110,000.00
March 2, 1895	40,000.00
June 3, 1896	235,000.00
Act of—	
March 3, 1899	$205,000.00
June 13, 1902	100,000.00
Allotted by Secretary of War from act of June 13, 1902	2,000.00
Total appropriations and allotments	1,888,500.00
Received from sale of condemned property	342.16
Received from refundment	9.30
Total	1,888,851.46

In addition to the above amounts about $60,000 from the appropriations for the survey of the river from Fort Benton to the mouth was spent on the part above Sioux City.

APPROPRIATIONS FOR IMPROVING UPPER MISSOURI RIVER BY SNAGGING.

Allotments made from appropriations of 1890 and 1892 for improvement of upper Missouri River	$193,073.53
Act of—	
March 3, 1893	50,000.00
August 18, 1894	50,000.00
June 3, 1896	50,000.00
March 3, 1899	50,000.00
Total	393,073.53

APPROPRIATIONS AND ALLOTMENTS FOR IMPROVING MISSOURI RIVER FROM MOUTH TO SIOUX CITY, IOWA.

Act of—		
July 5, 1884	$640,000.00	
August 5, 1886	375,000.00	
August 11, 1888	1,000,000.00	
February 22, 1890	75,000.00	
September 19, 1890	800,000.00	
July 13, 1892	600,000.00	
March 3, 1893	700,000.00	
August 18, 1894	700,000.00	
March 2, 1895	710,000.00	
June 3, 1896	300,000.00	
June 4, 1897	300,000.00	
July 1, 1898	300,000.00	
January 5, 1899	100,000.00	
March 3, 1899 (river and harbor)	100,000.00	
March 3, 1899 (sundry civil)	200,000.00	
June 6, 1900 (sundry civil)	250,000.00	
June 13, 1902	175,000.00	
Allotted by Secretary of War from act of April 28, 1904	50,000.00	
Total specific appropriations		$7,375,000.00

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[a] $2,832.42 of this transferred to work below Sioux City.
[b] $192,912 of this afterwards allotted to snagging.
[c] $163.51 of this afterwards allotted to snagging.

Balance from former appropriations:		
Act of August 2, 1882, applied to works above Sioux City, Iowa	$4,000.00	
Survey of Missouri River from mouth to Fort Benton	8,844.39	
Act of August 5, 1886, applied to removing obstructions from Missouri River	1,982.80	
Total balances		$14,827.19
Refunded on account of overpayments, etc		3,469.13
Received from transfer of materials		3,322.71
Received from transfer of surplus property		7,556.15
Received from urgent deficiency act of February 18, 1904		19.35
Received from sale of condemned and surplus property		11,420.40
Total		7,415,614.93

COMMERCIAL STATISTICS, UPPER RIVER.

During the calendar year 1903 the number of boats engaged in carrying freight and passengers, exclusive of those doing a strictly ferriage business, was 13, with a total tonnage of 1,204. The freight and passengers carried by them are as follows:

	Tons.		Tons.
Grain	11,614	Live stock	3,866
Coal and wood	3,720	Sand	3,969
Lumber	5,214		
General merchandise	8,023	Total	37,994
Miscellaneous	1,588	Passengers	11,420

Commerce of upper river, expressed in mile-tons, 2,506,791.

List of steamers and gasoline boats plying on the Missouri River between Sioux City, Iowa, and Stubbs Ferry, Montana, during the year 1903.

Name.	Where built.	Year built.	Year enrolled.	Tonnage.	Dimensions.			State-rooms.	Berths.	Passengers.	Engines.		
					Length.	Breadth.	Depth.				Number.	Diameter.	Stroke.
					Feet.	*Feet.*	*Feet.*					*Inches.*	*Feet.*
Washburn	Bismarck, N. Dak	1901	1901	57.48	98.0	24.8	3.0	4	10	37	2	9	4.0
Expansion	Expansion, N. Dak	1899	1899	78.60	123.0	26.0	3.5	8	18	48	2	9	4.0
Jim Leighton	Pierre, S. Dak	1895	1895	109.00	119.8	30.0	4.0		2	3	2	12	4.0
Josie L. K	Chamberlain, S. Dak	1884	1896	27.00	75.0	16.0	2.5				2	6½	1.5
F. Y. Batchelor	Pittsburg, Pa	1868		313.00	190.0	30.0	4.5	7	14	64	2	13	5.0
Imelda	Fort Yates, N. Dak	1892		30.00	90.0	17.0	2.0				2	5	
Bismarck [a]	Bismarck, N. Dak	1896	1900	93.00	120.0	21.0	4.0	1	2		1		
Peerless [a]	Pierre, S. Dak	1897	1897	[b] 50.00	83.0	21.0	3.5		4		1		
Scotty Philip [a]	do	1900	1900	69.00	106.6	23.8	3.5		2	1	1	13	22.5
Annie Austin [a]		1898		19.00	61.0	15.5	2.5						
Vermillion [a]		1901		[b] 20.00	51.0	20.5	2.5						
Nellie L. [a]		1900		15.00	60.0	13.5	2.2						
Cannon Ball [a]		1895		[b] 20.00	71.0	14.0	3.2						
Alace A. [a]		1900		18.00	61.5	16.5	2.5						
Pride of the West [a]		1899		16.00	40.5	22.5	2.5						
Little Maud		1900		89.00	105.0	23.0	4.5						
Myrtle [a]	Pierre, S. Dak	1896		7.00	32.0	7.0	3.0						
Eda [a]		1900		22.00	39.0	24.0	2.5						
Iowa [a]		1897		48.00	91.0	18.0	2.7						
Swallow [a]		1898		17.00	48.0	10.5	4.5						
Rose		1886		[b] 9.00	44.0	10.0	2.9						
Lora	Stillwater, Minn	1900	1900	257.00	150.0	30.0	4.5			([c])	2	12	6.0
Wm. Towle	Metropolis, Ill	1891	1903	95.00	90.0	16.0	3.0	4	8	([c])	2		4.5
J. H. Keene	Chamberlain, S. Dak	1903	1903	97.00	122.0	28.0	3.4			45	1	13	2⅙

[a] Gasoline.

[b] Estimated.

[c] Open cabin.

List of steamers and gasoline boats plying on the Missouri River between Sioux City, Iowa, and Stubbs Ferry, Montana, during the year 1903—Continued.

Name.	Boilers.						Iron or steel.	When built.	Steam pressure allowed.	Licensed to run.	Name of owner.
	No.	Length.		Diameter.	Flues.						
					No.	Diameter.					
		Ft.	*in.*	*Inches.*		*Inches.*					
Washburn		8	9	72		3	Steel	1901	145	Missouri River	Bismarck, Great Falls and Washburn Rwy.
Expansion		9	0	72		3	do	1903	150	do	Do.
Jim Leighton		22	0	42	8	8	do		135	Missouri River between Bismarck and Sioux City.	Chicago and North Western Rwy.
Josie L. K		9	0	42	45	2½	do	1900	140	Missouri River between Chamberlain and Sioux City.	Yankton Bridge and Ferry Co., Yankton, S. Dak.
F. Y. Batchelor	2	24	0	40	10		Iron		145	Missouri River	J. Leach & Sons, Running Water, S. Dak.
Imelda	1	5	0	48				1892	200	do	I. P. Baker, Bismarck, N. D.
Bismarck[a]											Do.
Peerless[a]										Missouri River, Fort Benton and St. Louis.	Do.
Scotty Philip[a]										Missouri River	Missouri River Transportation Co., Pierre, S. Dak.
Annie Austin[a]											H. I. Brown, Ponca, Nebr.
Vermillion[a]											Ole Barrenson, Vermilion, S. Dak.
Nellie L.[a]											Dennis Moran, Lake Andes, S. Dak.
Cannon Ball[a]											J. D. Leach, Cannon Ball, N. Dak.
Alace A.[a]											Pearson & Demar, Ionia, Nebr.
Pride of the West[a]											A. B. Millick, St. Helena, Nebr.
Little Maud											Joseph Leach, Running Water, S. Dak.
Myrtle[a]											E. E. Lindsay, Fort Pierre, S. Dak.
Eda[a]											F. J. Whitthous, Wagner, S. Dak.
Iowa[a]											J. W. Sanford, Chamberlain, S. Dak.
Swallow[a]											Hutton & Brown, Springfield, S. Dak.
Rose											N. Hilger, Helena, Mont.
Lora		18	0	42	5	6	Steel	1887	160	Mississippi and Missouri rivers	Sioux City Steamboat and Excursion Co.
Wm. Towle	1	28	0	54	5		do		145	Missouri River, Kansas City to Fort Benton.	Richardson & Powers, Sioux City, Iowa.
J. H. Keene[a]										Missouri River, St. Louis to Fort Benton.	J. W. Sanford, Chamberlain, S. Dak.

[a] Gasoline.

COMMERCE OF THE MISSOURI RIVER FROM MOUTH TO SIOUX CITY, IOWA, DURING THE CALENDAR YEAR 1903.

The long-distance trade was done by the St. Louis and Hermann Packet Company, of Hermann, Mo., with their steamers *Grapevine* and *Kennedy*, in the trade between St. Louis and Giles Landing.

These steamers and those engaged in the local trade carried 845 passengers during the year, exclusive of flood-period passengers.

The steamer *Columbia* carried 153,500 passengers during the flood of June and July between Kansas City, Mo., Kansas City, Kans., and near-by points.

The St. Louis and Hermann Packet Company sold their long-trade steamer *Grapevine*, in June, to parties on the Ohio River, and their Gasconade River steamer *Buck Elk*, in August, to the Buck Elk Steamboat Company, of Hermann, Mo.

The following table, giving the amount of freight carried, towed, and rafted, but not including any ferriage, is an approximation to the lower Missouri River's trade for 1903:

TABLE 1.

Class.	Grain.	Live stock.	Lumber and wood.	Building material and sand.	General merchandise, farm machinery, etc.	Total.	Mile-tons.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	
Long-trade packets	836	306	193	69	972	2,376	494,746
Short-trade packets and miscellaneous boats	39,488	2,349	2,050	579	7,039	51,505	1,250,966
Sand and wood steamers and barges	56	....	....	678,822	....	678,878	149,994
Rafts	....	....	1,985	....	....	1,985	95,911
Riprap, willows, and lumber, used by private parties for bank protection in the vicinity of Kansas City, Mo	....	....	....	15,547	....	15,547	237,714
Total	40,380	2,655	4,228	695,017	8,011	750,291	2,229,331

The following table gives the totals for the different classes of trade during the last six years for the lower Missouri:

TABLE 2.

Class.	Total tons carried.					
	1903.	1902.	1901.	1900.	1899.	1898.
Long-trade packets	2,376	7,989	7,806	4,397	715	3,641
Short-trade packets and miscellaneous boats	51,505	38,051	87,588	34,787	37,610	39,245
Sand and wood steamers and barges	678,878	334,164	463,340	232,395	218,514	252,152
Rafts	1,985	12,073	10,935	5,727	6,275	5,755
Mattress brush, stone and dike material for bank protection	15,547	18,250	....	....	....	19,000
Total	750,291	410,527	569,669	277,306	263,114	319,793

TABLE 3.—*Comparative commerce of the lower Missouri River expressed in mile-tons.*

Class.	Mile-tons.					
	1903.	1902.	1901.	1900.	1899.	1898.
Long-trade packets	494,746	1,435,605	999,116	558,807	98,193	526,304
Short-trade packets	1,250,966	626,925	1,039,767	360,378	410,530	522,872
Sand and wood steamers and barges	149,994	429,492	668,783	460,440	422,606	359,948
Rafts	95,911	570,137	195,872	103,975	126,432	145,437
Mattress brush, stone and dike material for bank protection work	237,714	164,750	....	....	....	375,000
Total	2,229,331	3,226,909	2,903,538	1,483,600	1,057,761	1,929,561

APPENDIX A.

THE COMMERCIAL CLUB OF KANSAS CITY,
Kansas City, Mo., June 21, 1904.

DEAR SIR: Replying to your favor of the 16th, I take pleasure in giving you information as per your suggestion.

In the early days Kansas City depended entirely upon the Missouri River for the transportation of goods from the East. The construction of railroads to and through this point beginning about 1865 developed so rapidly that by the time the Hannibal Bridge was completed in 1869 the future importance of the city as a railroad center had become well established. Without detailing the events which transpired during succeeding years, it might be stated that soon after freight-carrying boats were withdrawn from the Missouri River the absence of competition became clearly apparent. The first scale of rates established from St. Louis to Kansas City was as follows:

1	*2*	*3*	*4*	*5*	*A*	*B*	*C*	*D*	*E*
55	40	32	25	20	22½	17½	15	12½	11

The above figures were established at a time when the territory lying west of St. Louis was sparsely settled, and despite the development which followed, those same figures were increased to

60	45	35	27	22	24½	19½	17	13½	11

These rates were regarded as being too high for the service rendered; and with a determination to obtain relief, the business men of Kansas City organized a steamboat company which constructed three very large boats, intending to place them in the Missouri River trade. It was found later that the boats were too large for the Missouri River, owing to the fact that the stream had not received proper attention at the hands of the Government, and after several years of earnest effort the project was abandoned.

During the time these boats were in operation, however, the following rates were published and maintained, where possible to do so:

1	*2*	*3*	*4*	*5*	*A*	*B*	*C*	*D*	*E*
30	25	20	15	12	15	10	10	10	10

In addition to the above, a long list of commodity or special rates were carried on certain articles, and it was with the greatest difficulty that the boat line was able to secure business in competition with the rail carriers, even though the rates published by the latter were approximately 50 per cent higher.

The value of the Missouri River as a navigable stream was thus fully demonstrated, and it is believed that had the Government accorded proper attention, maintaining the river as it should for safe and economical navigation, water transportation would have continued, with a consequent saving of freight to the merchants of Kansas City and those located west of us.

Tariff rates are now rigidly maintained by the railroads, and they are from 30 to 50 per cent higher than those actually applied in previous years.

The value of the Missouri River, properly maintained, is incalculable to the business men of Kansas City. There is no question but what the Missouri River is a navigable stream, and to my mind should be so considered by the Government.

Within the past year our transportation bureau, as well as myself, have had several visits from a reliable party, who has gone into the subject very fully regarding the establishment of a line of boats suitable for Missouri River traffic. If the river was put in condition so that the boats could with any degree of safety operate, I haven't any doubt that before long such a line would be established.

There is no assurance that the present rates now operated between St. Louis and Kansas City and points north of Kansas City will be maintained for any length of time, as you understand fully that the railroads are in a combination or pool to such an extent that in a very short time the citizens of Kansas City and other points along the Missouri River will be forced to resort to water transportation for their own protection, as they did as spoken of heretofore.

Should there be any questions that you desire to ask pertinent to this proposition, I will be pleased to answer the same as fully as possible, and trust that you will not hesitate to call upon me for any and all information that you desire. To say that we are interested does not express it, and I shall take great pleasure in giving you any information I can.

With kindest regards, I remain, yours, very truly,

C. D. PARKER, *President.*

Maj. H. M. CHITTENDEN, *Wawona, Cal.*

REPORT OF MR. W. R. DEWITT, ASSISTANT ENGINEER.

Sioux City, Iowa, *June 30, 1904.*

Major: I have the honor to submit the following annual report of operations on the Missouri River from Sioux City, Iowa, to its mouth, for the current fiscal year ending June 30, 1904:

I reported for duty August 10, 1903, and took charge of the work after a trip of inspection with Asst. Engineer Bathurst Smith, whose work up to that date is herewith included.

Operations comprised care and repair of plant, dike construction, dike and revetment repair, the measurement of new and reconstructed bridges, examinations and surveys, and snagging.

The work was carried on in accordance with your project of July 20, 1902, with funds derived from the following sources:

Balance July 1, 1903, of appropriation for Improving Missouri River from its mouth to Sioux City, Iowa, river and harbor act of June 13, 1902	$86, 194. 96
Sale of construction materials to upper-river work	684. 02
Property transferred	10. 00
From urgent deficiency act, February 18, 1904	19. 35
From refundments for overpayments	16. 04
Total available	86, 924. 37
Total expenditures for fiscal year ending June 30, 1904	63, 525. 18
Balance on hand July 1, 1904	23, 399. 19

PROJECT.

Your project of July 20, 1902, approved by the Chief of Engineers August 1, 1902, provided for the expenditure of $175,000, as follows:

For operating snag boat during two seasons	$20, 000
For work at Nebraska City, Nebr	500
For work in vicinity of St. Joseph, Mo	53, 000
For work near mouth of Little Blue River	4, 000
For work at Lexington, Mo	500
For work at Glasgow, Mo	7, 500
For work at Miami, Mo	500
For work above Rocheport, Mo	5, 000
For work in First Reach	40, 000
For work at Hermann, Mo	2, 000
Balance unprovided for	42, 000
Total	175, 000

After the flood of 1903 subsided it was found that the works generally had not sustained damages to the extent that had been expected, so that in some localities the amounts appropriated were in excess of the necessities, while the works at other points required more attention, and your verbal instructions were to use the small balance available for the current fiscal year in care and repair of plant and in maintaining the existing works.

PLANT.

During the first half of the year slight repairs were made to the yard ways at the Gasconade boat yard, the work of restoring the yard to its normal condition after the 1903 flood was completed, five I. C. 100-foot barges were wrecked and disposed of, three I. C. 100-foot barges and three cross boats were launched and disposed of by sinking near the bank below the yard, the steam tender *Arethusa* was thoroughly repaired, and slight repairs were made to the steam tender *Atalanta* and four 25 by 100 foot barges.

All plant in storage at the boat yard at Gasconade, Mo., was cared for by a small watch force.

The expenditure on account of this work was:

For watching and labor on account of plant	$1, 432. 51
For repairs to plant	3, 545. 71
For wrecking I. C. hulls, cleaning up yard after 1903 flood, shifting, pulling out and launching pieces, handling property and materials, and all other miscellaneous expenses at yard	5, 610. 33
Total	10, 588. 55

During the second half of the year the following pieces were put in thorough repair, except what was necessarily left to be done just prior to launching:

1 hydraulic grader.
1 pile sinker.
1 mat boat.
1 16 by 64 foot barge, containing office cabin.
4 skiffs repaired and 3 new ones built.
4 25 by 100 foot barges were calked, rakes and sides calked above light water line.

Slight repairs were made to the roof of the yard quarters, the levee around the yard was restored to its old grade, and all property was cleaned and properly stored.

The usual watch force was on duty in the care of plant and property.

The expenditure on account of this work was:

For watching and labor on account of plant	$2,266.47
For repairs to plant	3,282.32
For all other miscellaneous items	655.90
Total	6,204.69

Or a grand total of $16,793.24, expended at the boat and supply yard at Gasconade, Mo., for the entire fiscal year.

The following pieces of plant were more or less actively engaged during the working season, at the end of which they were taken to the yard, a few bad hulls pulled out on the ways and the balance placed in the Gasconade River:

1 snag boat, *James B. McPherson.*
8 25 by 100 foot barges.
1 25 by 100 foot barge containing quarters.
1 16 by 64 foot barge containing office cabin.
1 hydraulic grader.
1 mattress boat.
1 pile sinker.
5 skiffs.

The snag boat *C. R. Suter* had been brought from her winter quarters on the Mississippi River, opposite Chester, Ill., to the Gasconade boat yard during the month of June, 1903. Her roof was given two coats of paint.

NEAR MOUTH OF LITTLE BLUE.

On July 1 the fleet that was in active operation was at work on this reach, closing the gap in Dike 2A.

This work consisted in constructing 240 linear feet of 3-row pile work on the standard plan, and was completed July 15, 1903.

The cost of this work was $1,569.71.

Between the dates of July 13 and July 14, 1903, the snag boat *James B. McPherson* moved the fleet from Little Blue reach to Lexington, Mo.

LEXINGTON, MO.

The work here consisted in extending Dike 3 out 50 feet, driving ice break-up on upper side and trail on lower side at end of dike, and repairing Dike 1 by replacing bracing and screening that had been damaged by ice.

This work was completed July 18, 1903, and the expenditure amounted to $343.97.

On July 18 and 19 the snag boat *McPherson* moved the plant to Wilhoite Bend.

MIAMI, MO.

When the fleet passed this point on July 19, 1903, the dike in this vicinity was entirely submerged and nothing was done.

The only work necessary here is to strengthen the end of the dike, and this will be done during the present season.

WILHOITE BEND.

In this bend three bankheads, 4C, 5C, 6C, were built in 1897 and afterwards extensively remodeled and repaired each year since, when funds were available.

The flood of 1903 damaged the two lower structures, 5C and 6C, considerably, though on account of high water they could not be thoroughly repaired. They will be given attention during this season.

The work done consisted in making 160 fascines, composed of stone and brush, 4 feet in diameter and 16 feet long, and placing them at the upper end of bankhead

5C, where the bank was caving rapidly; replacing 11 piles in the eddy dike below bankhead 5C and rebracing and screening the entire dike; making and placing 75 fascines just below bankhead 6C, where the bank was caving rapidly, and constructing a levee 2,220 feet long from just above the root of the longitudinal dike to bankhead 6C, to prevent an overland flow from flanking the structures.

The cost of this work was $2,322.25, and was completed August 5, 1903, except the levee work, which was built during the month of November, 1903.

Between August 5 and August 10 the snag boat *James B. McPherson* moved the fleet from Wilhoite Bend to Murray Bend.

FIRST REACH.

Murray Bend.—The work in this bend, 10,117 feet of revetment, was badly damaged by the 1903 flood, 1,300 feet having been scoured out at the head and the bank badly scoured out back of the revetment at three points near the foot.

The 1,300 feet of exposed bank at the head of the revetment was protected by making and placing 775 fascines, composed of brush and rock, 4 feet in diameter and 16 to 20 feet in length, and 3 fascine dikes, aggregating 350 feet in all, were built on the bank at the three points mentioned, near the foot, to cause the bank to be replaced to its original condition by filling.

This work was commenced August 8 and completed October 16, 1903, at a total cost of $6,017.37.

On October 1, 1903, the steam tender *Atalanta* was put in commission to relieve the *McPherson,* which boat from then to the end of the season was engaged in snagging.

Between October 16 and 19 the steam tender *Atalanta* moved the fleet from Murray Bend to St. Aubert Bend.

St. Aubert Bend.—The revetment in this bend was in good shape except at its foot, where it was being rapidly destroyed by eddy action.

To break up this eddy and prevent further damage a fascine dike was built at the foot of the revetment 8 feet in height, 16 feet in width, and 100 feet in length.

The work was completed October 21, 1903, at a cost of $676.70.

On the same day the fleet was removed to Chamois Bend.

Chamois Bend.—In this bend 14,630 linear feet of revetment had been built, and 3,900 feet below the foot of this revetment was constructed in 1897 the first bankhead on the Missouri River.

The flood of 1903 flanked the latter structure and put the main channel between the bankhead and the main right bank, causing the bank to cave rapidly from the foot of the revetment to the point of land several hundred feet below the bankhead.

In order to prevent further erosion and maintain the channel in its present position, nine 3-row pile dikes, averaging 100 feet in length each, and spaced 300 feet apart, were built along the main right bank, beginning at the foot of the revetment.

This work was commenced October 22, and, after a cessation of operations of twenty-one days, it was completed December 12, 1903.

Its cost, exclusive of old materials on hand from previous appropriation, amounted to $4,499.86.

Upon completion of this work the working plant was towed to the boat yard at Gasconade and laid up for the winter, some leaky hulls being pulled out on the yard ways and the balance placed in the Gasconade River.

In accordance with the approval of the Chief of Engineers, dated October 8, 1903, the plant and force was engaged at Chamois, Mo., having been loaned to the people of Chamois for twenty-one days during the month of November, 1903, at the expiration of which time the plant was returned in good condition. During that time seven 3-row pile dikes, similar to the ones just constructed, were built against the right bank just above the bankhead, at a cost of $3,012.66, exclusive of materials, forming a system of 16 dikes and protecting 4,500 linear feet of bank. The cost of all old material expended on the 16 dikes was $7,625.74, making a grand total cost of the entire work $15,138.26, of which $3,012.66, or about 20 per cent, was expended by the people living in the vicinity.

A map showing bank line of 1897, present bank line, and the dikes as built, accompanies.

Vicinity of Jefferson City, Mo.—As there was quite a flow through a chute back of Cedar Island, opposite Jefferson City, Mo., it was decided to close the chute and thus confine all the water to the main channel.

This was done by a combination fascine and abattis structure, 249 feet long, built across the head of the main chute farther down and nearly on line of Dike P, and a fascine dike, 75 feet long, built across the head of a dry chute leading into the main chute.

These three structures were built between December 14, 1903, and January 31, 1904, with an expenditure of $862.95.

During the same interval of time the first dike below the Jefferson City Bridge was thoroughly repaired by rebracing 70 linear feet and screening 150 linear feet, with an expenditure of $66.61.

Upon completion of this work the force was disbanded on account of severe weather.

HOWARD BEND.

The flood of 1903 had cut away the bank at the root of the longitudinal dike built in this bend in 1900 for a distance of 50 feet back of the root of the dike, leaving it in such condition that in every ordinary high water there would be quite a flow between the root of the dike and the main bank.

This was obviated by the construction during the month of March, 1904, of a fascine dike, 9 feet in height, 18 feet in width, and 90 feet in length, connecting the third bent from the shore end of the dike to the main high bank just above the destroyed bank back of the root.

The cost of this work was $381.68.

This was the last of active operations during the year, and upon completion of this work March 26, 1904, the entire force was reduced to the ordinary force of watchmen to care for plant and property at the Gasconade boat yard and remained so to the end of the fiscal year.

BRIDGES.

In accordance with your verbal instructions, the following new and reconstructed bridges were measured, and all found to agree satisfactorily with the approved plans.

Longitudinal sections of these bridges showing measurements taken are on file.

Burlington and Missouri River Railroad bridge at Plattsmouth, Nebr.
St. Joseph and Grand Island Railroad bridge at St. Joseph, Mo.
Electric railway bridge at St. Charles, Mo.

SNAGGING.

The work contemplated under the approved project was the removal of snags and other obstructions in the Missouri River below Sioux City, Iowa, covered by commercial boats.

From July 1 to July 13, 1903, the snag boat *James B. McPherson* was in the vicinity of Kansas City, Mo., attempting to remove débris resulting from the 1903 flood, but little or nothing was accomplished. On the latter date, the boat was assigned to the duty of moving plant and materials for the construction party, and remained at that work until October 3, 1903, when the river having subsided to a snagging stage, that work was taken up at Hermann, Mo., and the boat had worked her way up to Boonville, Mo., reaching there October 14, 1903, when by your directions she was ordered to run through to Kansas City, Mo., for the purpose of making a trip of inspection from that point to the mouth of the river.

With yourself and the writer on board, the boat was cleared from Kansas City, Mo., October 19, 1903, and reached the mouth of the river October 23, 1903.

Snagging operations were then resumed and the boat worked her way up from the mouth of the river to Murray Bend, reaching there November 16, 1903, on which date she returned to the Gasconade boat yard and was laid up for the winter in the mouth of the Gasconade River.

The following work was accomplished during the season:

Snags removed	215
Number of trees felled and removed from caving banks	183
Miscellaneous obstructions removed	4
Miles run—	
Downstream	489
Upstream	443

The expense of operating the snag boat for the season was—

While engaged in construction work	$6, 317. 08
While engaged in snagging	6, 669. 52
Total	12, 986. 60

INSPECTION OF WORKS, EXAMINATIONS, AND SURVEYS.

Kansas City, Mo. to the mouth of the river.—All works below Kansas City, Mo., were inspected between the dates of October 19 and October 23, 1903.

Kansas City, Mo., to Sioux City, Iowa.—An examination of works at Quindaro, Kans., St. Joseph, Mo., Nebraska City, Nebr., and Omaha, Nebr., was made between December 9 and December 13, 1903, and special report submitted to you under date of December 15, 1903.

Decatur, Nebr.—An examination was made of the river at this point and special report made to you on September 12, 1903, as called for by petition of Commercial Club of Decatur through Chief of Engineers.

Omaha, Nebr.—Three examinations were made of the right bank of the river between the Terminal Railway bridge and Florence Lake revetment and special reports made to you under dates of September 22, October 5, 1903, and May 7, 1904. These examinations were called for by letters from Mr. John R. Webster, Senator J. H. Millard, and Mr. John A. Scott, of Omaha, Nebr.

Nebraska City, Nebr.—An examination of conditions above the longitudinal dike opposite Nebraska City, Nebr., was made February 9, 1904, in company with Mr. I. P. Weeks, chief engineer of the Burlington and Missouri River Railroad in Nebraska, and special report submitted to you under date of February 10, 1904.

Nearman Bend, Kansas.—An examination was made of the river in this vicinity and special report submitted to you under date of February 29, 1904.

Lime Creek, Missouri.—On complaint of Mr. Herbert H. Clark, of Kansas City, Mo., stating that some piles had been unloaded near mouth of Lime Creek, Missouri, for purpose of building a dike, which, if built, would damage his land, an examination was made and a special report submitted to you under date of May 3, 1904.

Kansas City, Mo.—In company with yourself and officials of the Chicago, Milwaukee and St. Paul Railroad Company, an examination was made September 1, 1903, of the damage done to the Randolph Bridge below Kansas City, Mo., by the 1903 flood.

On September 9, 1903, the height of the Missouri and Kansas Telephone Company's wires over the Missouri River at Kansas City, Mo., was measured and special report made to you under date of September 12, 1903. This resulted from complaints filed by steamboat men.

Cranberry Chute, Missouri.—A complaint having been filed by some citizens of Carrollton, Mo., against a dam being constructed in Cranberry Chute by S. J. and Stonewall White, an examination of the dam was made and report submitted to you in February, 1904.

Waverly, Mo.—Under date of March 28, 1904, a special report was submitted to you on conditions at Waverly, Mo., a knowledge of which was obtained at time of examination of the dam built in Cranberry Chute.

Wilhoite Bend, Mo.—An examination was made of the works and conditions of river in Wilhoite Bend, Mo., and a special report submitted to you under date of September 14, 1903.

Cambridge, Mo.—An examination was made of the Chicago and Alton Railway Company's revetment in Cambridge Bend in company with Mr. H. F. Baldwin, chief engineer for the company, and report submitted to you November 15, 1903.

Hartsburg, Mo.—An examination was made of the conditions of river in the vicinity of Hartsburg, Mo., and a special report submitted under date of December 14, 1903.

Cedar Island, Mo.—An examination of conditions at the head of Cedar Island, Mo., was made and report submitted to you by Assistant Engineer Bathurst Smith, August 15, 1903.

Chamois, Mo.—An examination was made of the works and conditions of river in Chamois Bend and report submitted to you under date of May 27, 1904.

Portland Island, Mo.—An examination of works and conditions of river in vicinity of Portland Island, Mo., by Overseer John S. Campbell and a special report made to you under date of June 18, 1904.

Bear Island, Mo.—An examination of conditions of river in vicinity of Bear Island, Mo., was made by Overseer John S. Campbell on June 16 and a special report submitted to you under date of June 24, 1904.

Emily Bend, Mo.—Permission had been requested by some farmers living in the vicinity of New Haven, Mo., to build some dikes across the chute between Park Island and the main left bank, known as Emily Bend, in order to close the chute and protect their lands. An examination of the river in that vicinity and a special report with recommendations was submitted to you under date of August 13, 1903.

Washington, Mo.—An examination of conditions of river opposite Washington, Mo., was made the subject of a special report submitted to you under date of March 22, 1904.

Gumbo, Mo.—An examination of conditions of river near Gumbo, Mo., was made the subject of a special report submitted to you under date of May 18, 1904.

Howard Bend, Mo.—Two examinations of the works and the conditions of river in Howard Bend were made during the year and special reports submitted under dates of January 26, 1904, and April 5, 1904.

Pelican Bend, Mo.—An examination of the revetment in Pelican Bend was made August 25, 1903, and a verbal report made to you September 1, 1903. The work was found to be in good condition throughout, except a slight cutting of the bank back of the revetment, near its foot.

Harbor line surveys were made at St. Joseph, Mo., and Kansas City, Mo., and maps prepared.

A survey of the bank line along which the dikes were built in vicinity of Chamois. Mo., was made and map prepared.

Very respectfully,

W. R. De Witt,
Assistant Engineer.

Maj. H. M. Chittenden,
Corps of Engineers.

REPORT OF MR. E. D. VINCENT, ASSISTANT ENGINEER.

Major: I have the honor to submit the following report of operations on the improvement work of the upper Missouri River under my charge, between Sioux City, Iowa, and Stubbs Ferry, Montana, for the fiscal year ending June 30, 1904. Owing to lack of funds no new work was undertaken in this district except some bank protection in front of Fort Benton, Mont., and some new dike work at Yankton, S. Dak.

(*1*) *Fort Benton, Mont.*—The first protection work in front of Fort Benton was constructed during the summer of 1900, when 450 linear feet of bank was protected, extending from the wagon bridge downstream. The work at this point this season consisted in revetting 775 linear feet of bank in front of the town, extending from the wagon bridge upstream. The work was commenced in September, 1903, and completed the middle of October of the same year. The bed of the river in the vicinity of Fort Benton is composed of heavy gravel, so that no underwater construction was necessary. The work consisted simply of fairing up and grading the upper bank and protecting it with riprap stone laid from 8 to 12 inches deep. The stone was quarried in the vicinity of Great Falls, Mont., and shipped to Benton by rail; 775 linear feet of bank was protected at a cost of $2,732.07, or at the rate of $3.525 per linear foot. The cost of this work is detailed in the appendix, Exhibit A.

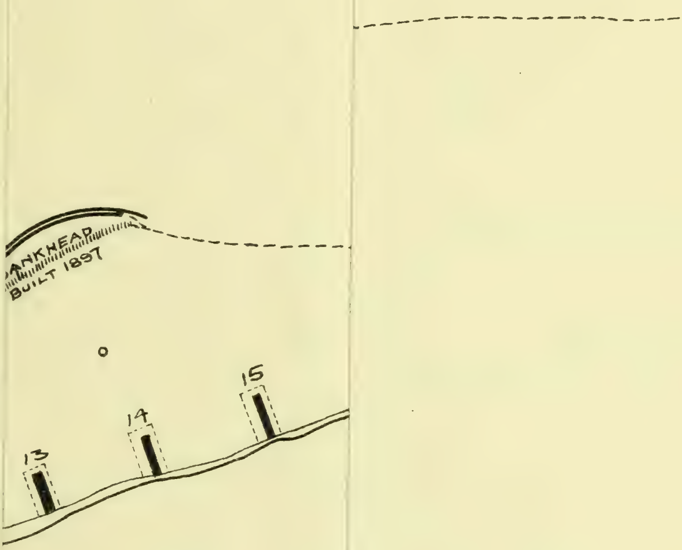
(*2*) *Bismarck, N. Dak.*—The field work in this locality consisted in repairing and strengthening the ends of the dikes of the system in the vicinity of Mandan, N. Dak. Seven dikes were repaired and strengthened by 3-row work. The repairs aggregated 423 linear feet of 3-row dike at a cost of $2,529.62. The cost of maintenance, care and repair of plant, and for administration was $1,005.56.

The total expenditure for Bismarck for the season was $3,535.18. Most of the material used for repairs was from stock in hand at Rockhaven, N. Dak.

(*3*) *Pierre and Fort Pierre, S. Dak.*—Improvement work at this point for the past season consisted in building a 3-row retaining dike around the shoulder at the head of Marions Island, to protect the revetted bank from a savage attack from the main flow of the river, setting hard in at this point. Five hundred feet of dike was constructed at a cost of $1,686.16. The material used was from the storage yard at Fort Pierre. Minor repairs were made to the dikes and revetment in this vicinity. The cost of maintenance and care and repair of plant at this station for the past season was $1,119.47. Total expenditure at Pierre and Fort Pierre for the season was $2,805.63.

A cable gauge is being maintained and read by the watchman at the Fort Pierre boat yard.

(*4*) *Yankton, S. Dak.*—The original project submitted for this point March 23, 1897, contemplated the fairing out and protecting the shore as far up as the site of the proposed bridge, 3½ miles above Yankton. When it became evident that the bridge would not be built in the near future, there was a revised project submitted and approved September, 1897, providing for the beginning of the construction of a system of dikes out from the right bank above Yankton, for the purpose of restoring the steamboat landing at the town. Of the group of six short dikes built in 1897–98, Nos. 4 and 5 and 200 feet of No. 6 were destroyed by the ice and drift in the break-up of 1899. During 1900, 2,450 linear feet of 3-row dike were built in this system, Nos. 6 and



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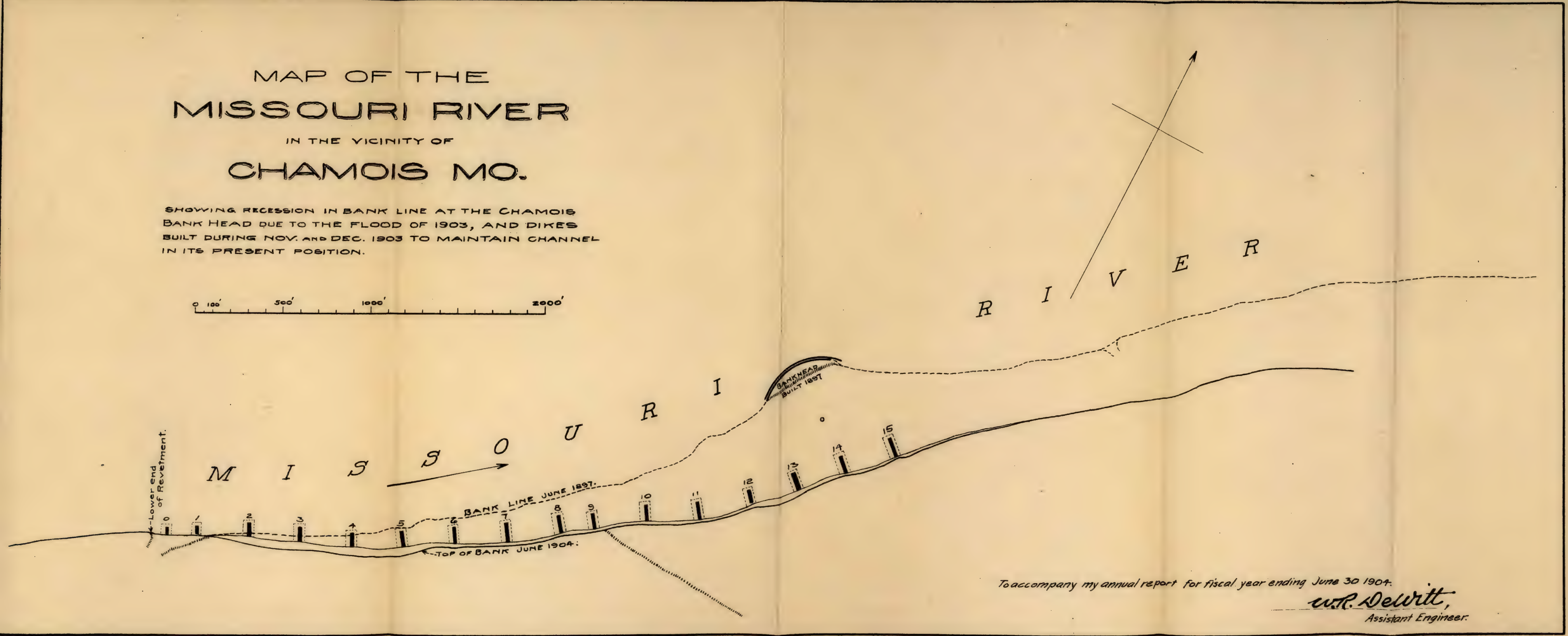


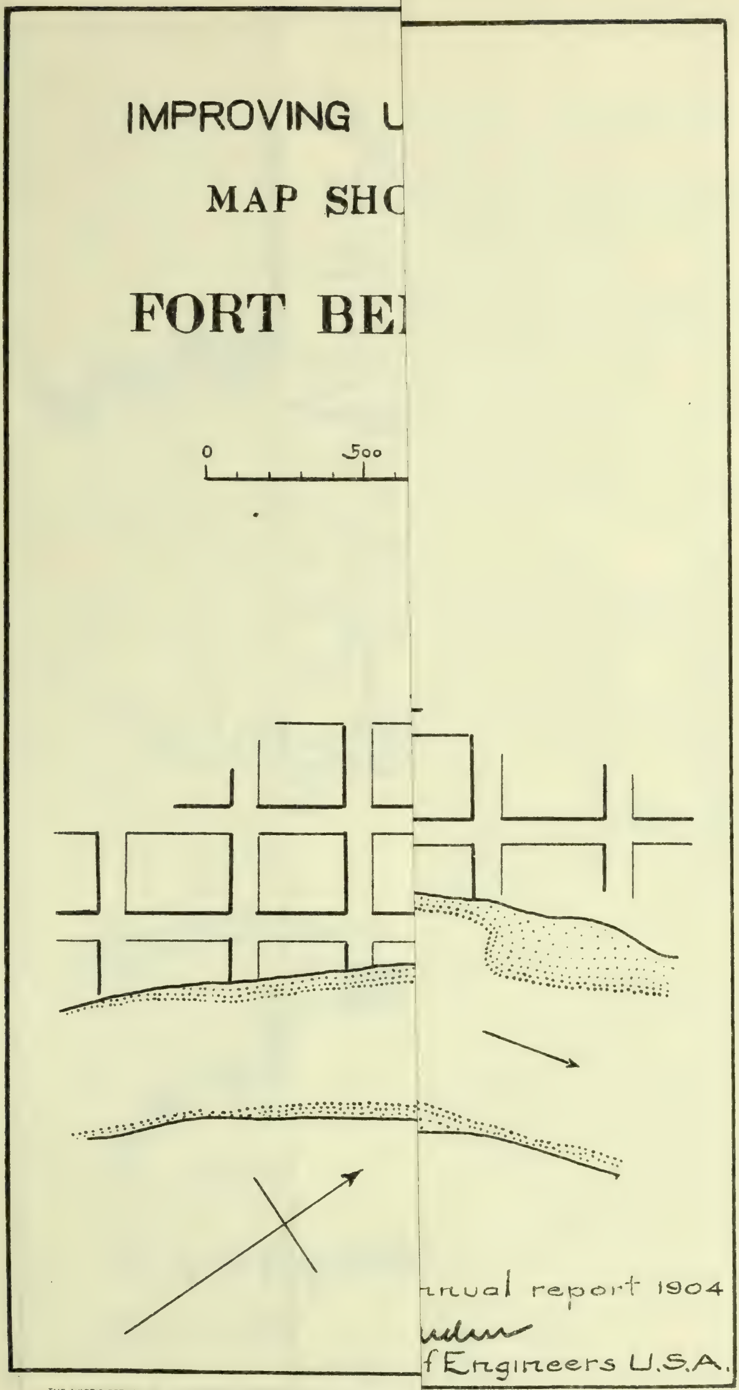
MAP OF THE
MISSOURI RIVER
IN THE VICINITY OF
CHAMOIS MO.

SHOWING RECESSION IN BANK LINE AT THE CHAMOIS BANK HEAD DUE TO THE FLOOD OF 1903, AND DIKES BUILT DURING NOV. AND DEC. 1903 TO MAINTAIN CHANNEL IN ITS PRESENT POSITION.

To accompany my annual report for fiscal year ending June 30 1904.

W. R. DeWitt,
Assistant Engineer.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.



THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON D. C.

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IMPROVING UPPER MISSOURI RIVER

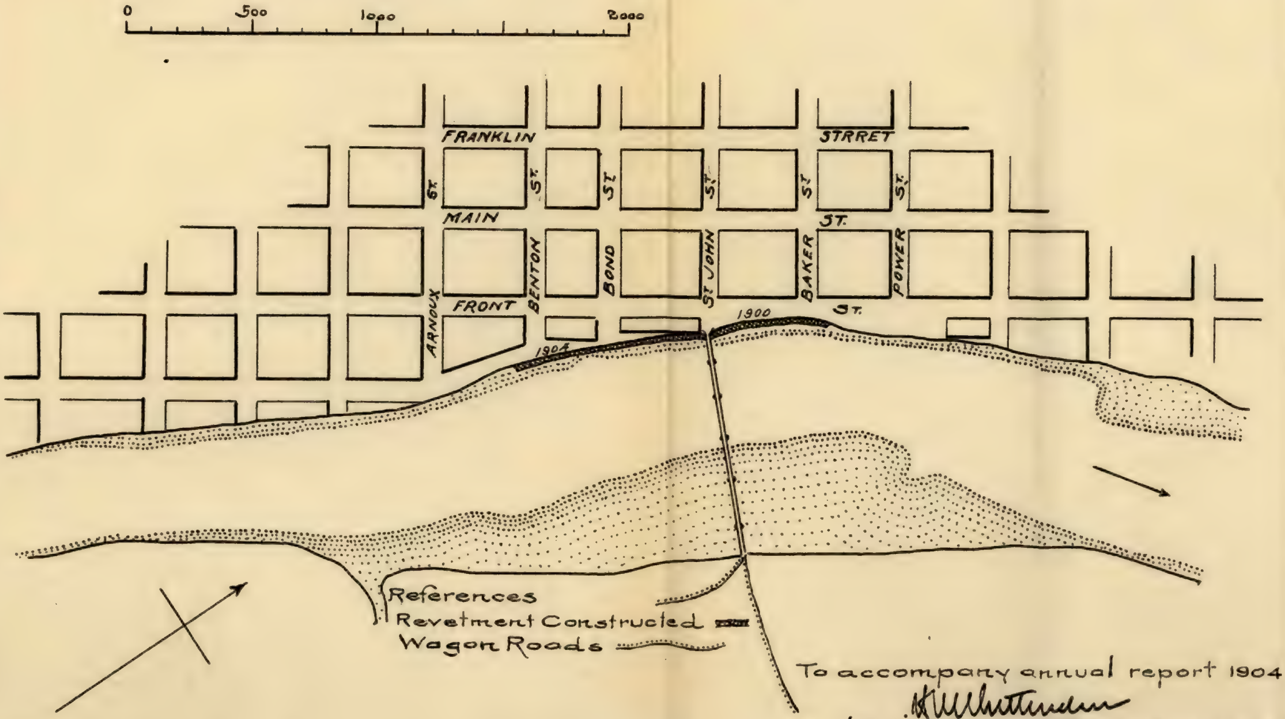
MAP SHOWING WORK DONE

IN VICINITY OF

FORT BENTON, MONTANA,

TO

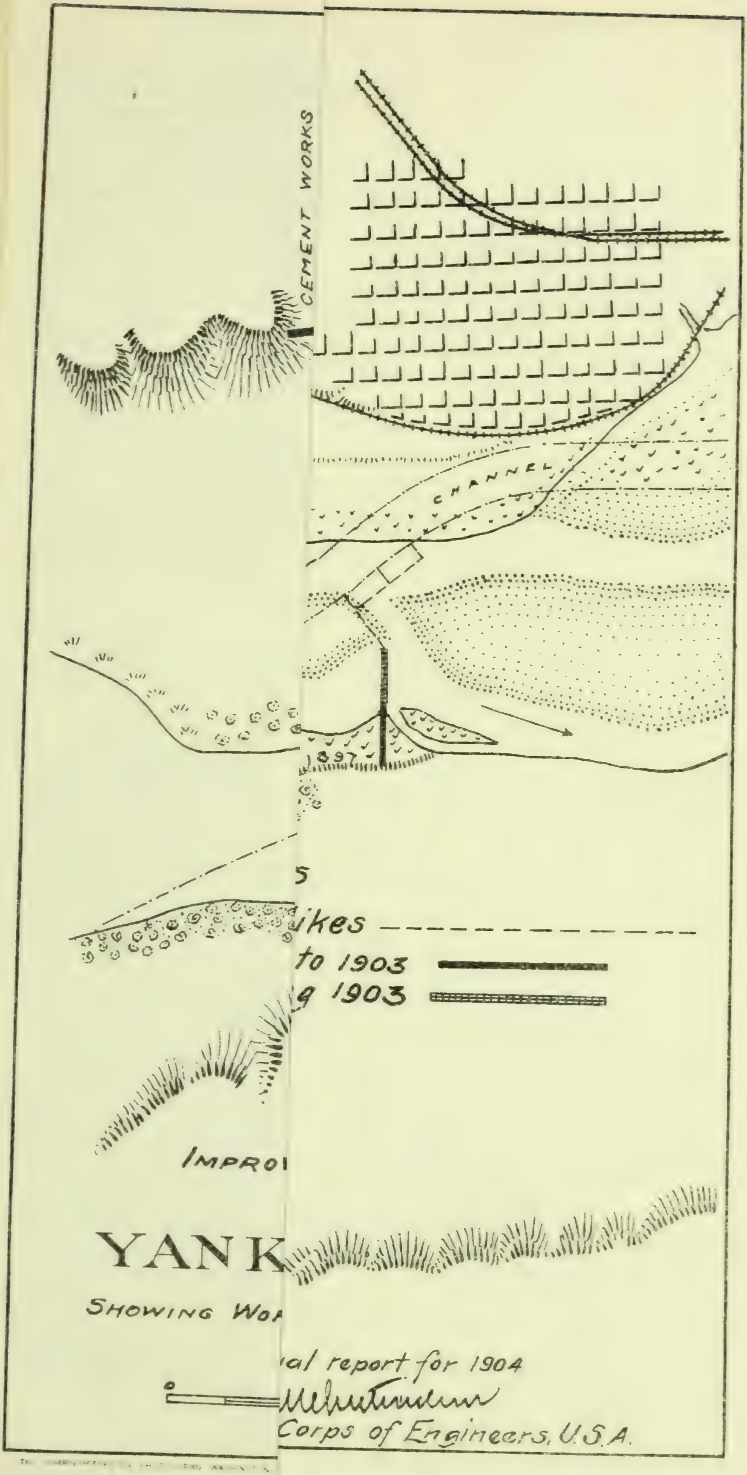
JUNE 30, 1904



To accompany annual report 1904

Major Corps of Engineers U.S.A.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D.C.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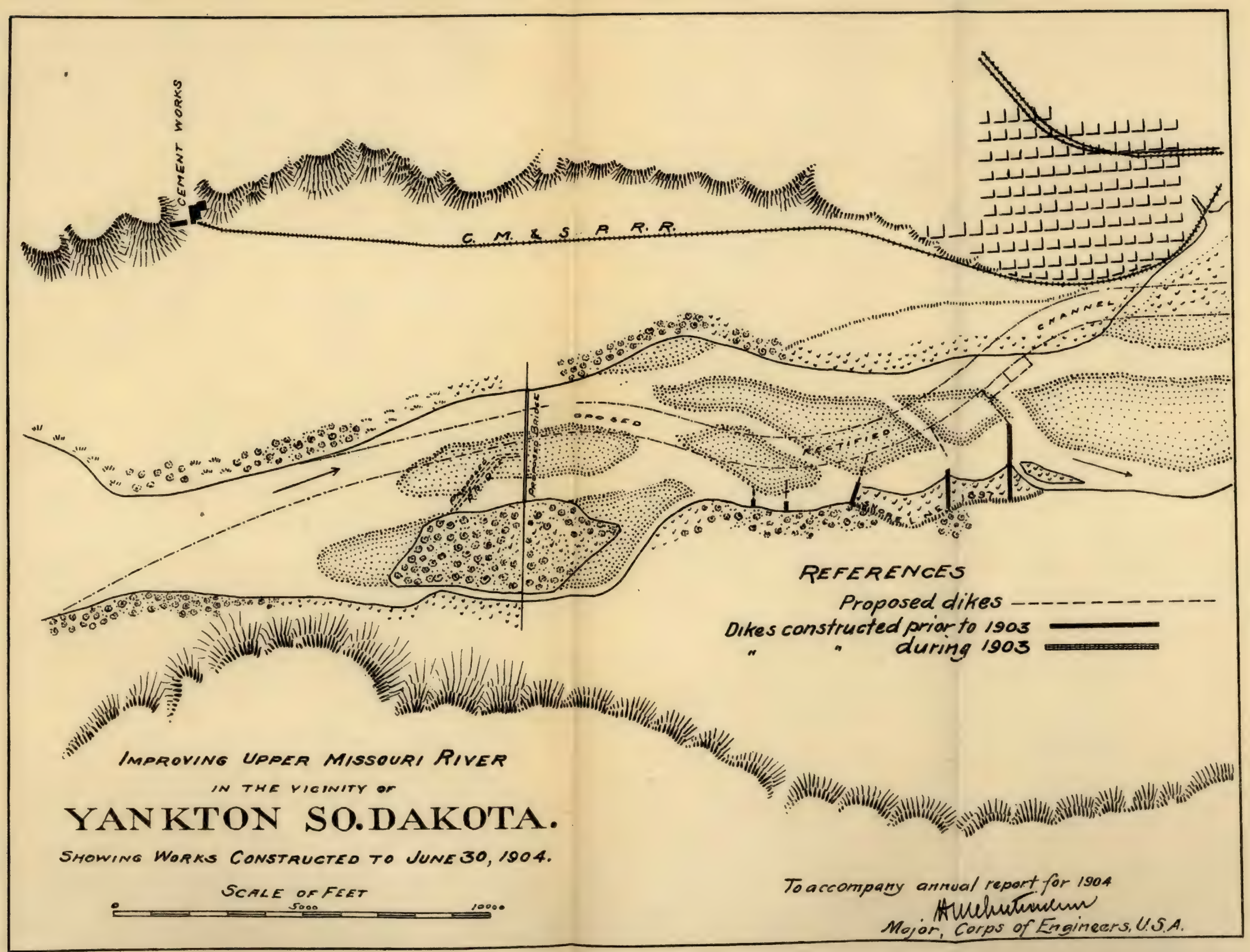

IMPROVING UPPER MISSOURI RIVER
IN THE VICINITY OF
YANKTON SO. DAKOTA.
SHOWING WORKS CONSTRUCTED TO JUNE 30, 1904.

To accompany annual report for 1904
H M Chittenden
Major, Corps of Engineers, U.S.A.

THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON, D.C.

7 of the lower dikes being extended 900 feet and a new dike, 650 feet long and located about 450 feet below the old location of No. 4, was built. This system of dikes, so far as constructed, while they had extended the shore line out in some places as far as 900 feet, had not turned the channel to the Yankton side, for it still persisted in hugging the ends of the dikes. The work at this point the past season has been in extending the system on out. The work has been done exclusively on Dike No. 7, the lowest one of the system, which was extended out 1,020 linear feet, and as it crossed the main channel of the river it was built unusually strong, being a 4-row construction throughout. Work was commenced early in June in the repair of the fleet at the Sioux City ice harbor. This was completed in July at a cost of $1,961.44, and the outfit, consisting of 1 steam pile driver and 8 barges and lighters, was towed to the work by the towboat *Robert.* Construction work was commenced the middle of July and carried forward through the summer and fall until cold weather, when the driver and part of the fleet were taken to the Sioux City ice harbor. The towboat and four barges remained at Yankton behind the dike for the winter. The bracing of the dike was carried forward through the winter, the crew working on the ice.

The 1,020 linear feet of dike cost $14,715.59, or at the rate of $14.43 per linear foot. The cost in detail is shown in the appendix, Exhibit B.

During the heavy run of ice from the upper-river break-up in the middle of April, 140 feet of the new dike was carried out, but the remainder of the structure remained firm. The end of the dike was repaired but not extended, and the structure is now accumulating an extensive bar growth in its vicinity; but it remains to be seen if, after the present June rise, the main channel has been shifted any beyond the present ends of the dikes.

Summary of expenditures at Yankton, 1903–4.

Repair of fleet	$1,961.44
Construction of 1,020 linear feet of 4-row dike	14,715.59
Repair of dike	825.35
Total	17,502.42

(*5*) *Elkpoint, S. Dak.*—No work was done at this point with the exception of the repair of 200 feet of the revetment constructed in 1900, which was torn out by the break-up this spring. The break was filled and a new mattress laid at a cost of $691.04.

(*6*) *Sioux City, Iowa.*—No new work was undertaken at this point the past season, the field work consisting of the repairs to about 700 linear feet of the revetment along the Sioux City front and the rebracing of the dikes in the system below the mouth of the Big Sioux River and those along the Floyd Bluffs below the Omaha bridge. Cost of these repairs, including administration and office expenses, was $3,463.68.

(*7*) *Sioux City, Nebr.*—The only field work on this reach of the river was the repair, in places, of the revetment from the combination bridge upstream, extending over a distance of three-fourths of a mile. The cost of same was $428.41.

(*8*) *Snagging.*—The snag boat *Mandan* was launched at Rockhaven ice harbor, near Bismarck, in July, and snagged on the upper reach of the river from Bismarck to Elbow Woods, 90 miles up, until in September, when the boat was ordered to proceed to the reach between Sioux City and Running Water and finish the season at Sioux City, but to remove all channel snags on the way down. This was done and the season was finished at Sioux City the middle of November, and the boat laid up at the Sioux City ice harbor for the winter.

During the four and one-half months in which the boat was operating she covered 1,667 miles of the river, removed 454 snags, and felled 160 trees, besides bringing the floating plant from Yankton to the Sioux City ice harbor.

The expense of operating the snag boat from the time she was put in commission until laid up for the winter and her care to the present time is:

Service account, pay rolls	$4,051.32
Fuel	1,163.26
Provisions	500.89
Materials, lines, etc	277.98
Administration, travel, and office expenses	799.89
Total	6,793.34

In the operations between Yankton and Sioux City, covering a reach of about 90 miles, 160 snags were removed from the channel of the river. Of these but one is what is known as a green snag, having gone into the river recently. The remainder were old trees that had been covered for centuries and had become exposed by the cutting of the banks. This fact would indicate that were the banks of the Missouri properly revetted and prevented from cutting, the danger from snags, which are the greatest menace to navigation on the river, would be practically eliminated.

Below is a statement of the amount and total cost of revetment constructed at various localities on the upper Missouri River since 1897; and also the cost of maintenance.

The total amount of revetment to date is 32,587 linear feet and the field cost is $184,401.42, or at the rate of $5.63 per linear foot. At a number of localities a narrow mattress was laid where the work was placed over old railroad revetment, and at Fort Benton, where the bottom of the river is of heavy gravel, no mattress at all was used.

The field cost of standard revetment where a 60-foot mattress or upward was used is shown to be $6.90 per linear foot. The cost of repairs to this total revetment constructed on the upper river since 1897 amounts to $6,529.60, or about 3½ per cent of the cost of construction. Prior to 1897 there was some revetment built by the Missouri River Commission in the vicinity of Sioux City, Iowa, and Vermilion, S. Dak.; but the work was of a temporary character and it has been either entirely destroyed, or changes in the river have left it far inland.

Field cost of standard revetment constructed on the Upper Missouri River from 1897 to date (1904).

Year.	Locality.	Width of mattress.	Length of revetment.	Cost per linear foot.	Total cost.	Cost of maintenance.
		Feet.	*Feet.*			
1897..	Bismarck	60	500	$4.47	$2,235.50	$106.00
1897..	Pierre and Fort Pierre	73½	2,847	5.36	15,266.48	....
1897..	South Sioux City	90	1,900	6.32	28,872.32	....
1897..	.....do	100	2,670			
1898..	Pierre and Fort Pierre	60	1,120	4.31	5,258.66	....
1898..	Sioux City	78½	824	6.40	5,286.16	....
1900..	Mandan	70	1,913	5.80	11,090.82	294.00
1900..	Bismarck	60	1,400	9.54	13,348.86	....
1900..	Pierre	82	1,790	4.74	8,492.15	1,737.73
1900..	Elkpoint	70	2,124	6.85	14,574.48	....
1900..	South Sioux City	60	2,288	5.29	12,104.30	....
1901..	Fort Benton	(*a*)	450	10.46	4,707.85	....
1901..	Elkpoint	70	3,440	5.39	18,566.08	809.70
1901..	South Sioux City	30	1,600	2.81	4,492.11	....
1901..	Sioux City	70	2,900	5.70	16,551.32	2,221.97
1902..	Pierre	70	205	6.44	1,321.50	240.75
1902..	Elkpoint	70	1,800	5.96	10,735.93	691.04
1902..	South Sioux City	45	1,982	4.30	8,516.83	428.41
1902..	Sioux City	70	50	5.70	285.00	....
1904..	Fort Benton	(*a*)	775	3.36	2,712.07	....
	Total	....	32,578	5.66	184,401.42	[b]6,529.60

[a] No mattress used in construction.
[b] Equals 0.0354 per cent total cost of construction.

Average cost per linear foot of revetment, $5.66.

Average cost standard revetment with mattress 60 feet and upward in width is $5.90 per linear foot.

I have the honor to report that all revetment work on the upper river is at present in good condition.

Very respectfully,

E. D. Vincent,
Assistant Engineer.

Maj. H. M. Chittenden,
Corps of Engineers.

EXHIBIT A.

Net cost of 775 linear feet of revetment along the river front at Fort Benton, Mont.

	Cost per item.	Total.	Per cent.
$442\frac{7}{8}$ tons of riprap stone, loaded on cars near Great Falls, Mont., and transported from cars to river bank at Fort Benton, at $2.15 per ton.	$952.18		
Freight on same from Great Falls, Mont., to Benton, at $1 per ton...	442.88		
		$1,395.06	51
Grading bank and placing riprap stone on 775 linear feet of bank, at $1.374 per linear foot	....	1,061.82	39
Administration and central office expenses	....	272.19	10
Total cost of 775 linear feet of revetment, at $3.525 per linear foot.	....	2,732.07	100

EXHIBIT B.

Net cost of 1,020 linear feet of 4-row dike at Yankton, S. Dak., constructed 1903–4.

	Cost per item.	Total.	Per cent.
Pile driving:			
12,782 linear feet oak piling delivered on river bank at Yankton, S. Dak., at $0.1372 per linear foot.......... $1,754.21			
5,948 linear feet pine piling delivered at Yankton, S. Dak., at $0.2465 per linear foot 1,465.82			
Cost of 18,370 linear feet piling, at $0.1753	$3,220.03		
Service account in driving 18,370 linear feet piling, at $0.04294 per foot	788.87		
Coal consumed, $52\frac{3}{4}$ tons, at $4.3147 per ton	227.60		
Towboat services	784.13		
Cost of driving 18,370 feet of piling, at 9.8 cents per linear foot..	1,800.60		
Total cost of 18,370 feet of piling driven in place, at $0.2733 per foot.	....	$5,020.63	34
Foot mattress:			
479.17 cords willows delivered on barge, at $1.77 per cord	848.13		
Towing to point of expenditure	397.24		
Service account, weaving 1,020 linear feet of 55-foot mattress, at $0.524 per linear foot	534.50		
40,000 feet of $\frac{3}{8}$-inch wire strand, at 94 cents per 100 feet, delivered.	376.00		
1,032 clips, at $2.75 per 100, $28.38; freight on same, $1.08	29.46		
Total cost of 1,020 linear feet of 55-foot mattress, at $2.32 per linear foot	....	2,185.33	15
Ballasting mattress:			
701.3 tons riprap stone f. o. b. Sioux Falls, S. Dak., at 50 cents per ton	350.65		
Freight on stone from Sioux Falls, S. Dak., to Yankton, S. Dak., at $0.78654 per ton	551.60		
Towboat services	320.00		
Service account, pay rolls, placing rock	303.10		
Hauling stone to river bank, at 30 cents per ton	210.38		
Total cost of 701.3 tons riprap stone delivered and placed, at $2.475 per ton	....	1,735.73	12
Bracing dike:			
71,403 feet B. M. coast lumber, delivered on river bank at Yankton, S. Dak., at $20.15 per 1,000 feet	1,841.77		
Boat spike nails, washers, etc	88.55		
11,785 lbs. $\frac{3}{4}$-inch bolts, at $2\frac{9}{10}$ cents	341.77		
Freight charges on iron	29.93		
Service, account pay rolls	1,155.85		
Service, account towing	254.50		
Total cost of bracing 1,020 linear feet of 4-row dike, at $3.64 per linear foot	....	3,712.37	25
Screening dike:			
81.09 cords poles delivered on barge, at $2.25	182.46		
17 cords poles stumpage, at $2	34.00		
Service, account pay rolls	398.93		
Service, account towing	205.00		
Total cost of screening 1,020 linear feet of dike, at $0.804 per linear foot	....	820.39	6
Administration and office expenses	....	1,231.14	8
Total cost of 1,020 linear feet of 4-row dike, at $14.43 per linear foot	....	14,705.59	100

A A 2.

IMPROVEMENT OF OSAGE RIVER, MISSOURI.

No work other than that of maintenance and repair has been done on the Osage River during the past year on account of insufficiency of available funds to undertake the work of completion of Lock and Dam No. 1.

In my last annual report, pages 1569 to 1571, I made a complete and detailed statement of the probable cost of completing this work. The conclusion was that in addition to the sum remaining available from past appropriations there would be required at least $70,000 to justify any attempt at completing the work. Since that date $2,470.26 have been expended in maintenance and repairs, and the works have suffered a good deal of damage from the high waters of both 1903 and 1904, and not less than $10,000 should be added to the estimate of last year, making $80,000 in all which would be necessary before the work of completion can be undertaken.

For detailed information see report of Mr. W. R. DeWitt, United States assistant engineer, attached.

Money statement.

July 1, 1903, balance unexpended	[a]$17,511.22
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	2,470.26
July 1, 1904, balance unexpended	15,040.96
July 1, 1904, outstanding liabilities	156.38
July 1, 1904, balance available	14,884.58

Amount (estimated) required for completion of existing project		Indefinite.
Amout that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$70,000.00	
For maintenance of improvement	10,000.00	
		80,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS AND ALLOTMENTS.

Act of—	
August 18, 1894	$46,000.00
June 3, 1896	50,000.00
March 3, 1899	25,000.00
June 6, 1900	146,000.00
June 13, 1902	30,000.00
Balances transferred January 15, 1895, from Maj. Charles J. Allen, Corps of Engineers:	
Act of September 19, 1890	42,655.18
Act of July 13, 1892	43,366.44
Refunded on account of overpayment	10.69
Total	383,032.31

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[a] Increased $5.14; balance act of 1896 omitted in 1903 report.

COMMERCIAL STATISTICS.

The steamboat traffic on the Osage River was performed principally by the steamers *J. R. Wells* and *Dauntless*, carrying 297 passengers.

TABLE 1.—*Close approximation to the amount of river trade during 1903.*

Class.	Grain.	Live stock.	Lumber and wood.	Railroad ties.	Building material and gravel.	Barytes.	General merchandise, farm machinery, etc.	Total.	Mile-tons.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	
Packets	1,498	489	960	40	10,639	85	1,534	15,245	263,018
Rafts, etc	......	......	......	23,256	....	....	....	23,256	970,723
Total	1,498	489	960	23,296	10,639	85	1,534	38,501	1,233,741

TABLE 2.—*Comparative statement of the commerce of the river from 1903 to 1896.*

Shipments.	1903.	1902.	1901.	1900.	1899.	1898.	1897.	1896.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Grain and hay	1,498	6,000	4,232	8,722	4,077	3,418	1,598	2,651
Live stock	489	153	1,058	934	873	1,038	909	843
Lumber, wood, and ties	24,256	74,385	56,221	76,583	57,663	74,881	66,175	62,764
Building material and gravel	10,639	12,369	8,000	7,500	9,945	3,015	1,350	4,500
General merchandise, farm machinery, etc	1,534	2,284	2,738	2,335	4,144	1,934	1,215	1,635
Barytes	85	3	90	70	....	....	....	....
Total	38,501	95,194	72,339	96,144	76,702	84,286	71,247	72,393

TABLE 3.—*Comparative commerce of the Osage River expressed in mile-tons, from 1903 to 1896.*

Class.	1903.	1902.	1901.	1900.	1899.	1898.	1897.	1896.
Packets	263,018	675,705	277,106	545,107	393,136	349,955	178,695	212,398
Rafts, etc	970,723	3,334,065	2,425,710	3,060,215	2,968,121	3,825,099	3,707,200	3,839,483
Total	1,233,741	4,009,770	2,702,816	3,605,322	3,361,257	4,175,054	3,885,895	4,051,881

REPORT OF MR. W. R. DEWITT, ASSISTANT ENGINEER.

SIOUX CITY, IOWA, *June 30, 1904.*

MAJOR: I have the honor to submit the following annual report pertaining to the Osage River for the fiscal year ending June 30, 1904.

Operations consisted of care of plant and property at Lock No. 1, measurement of new bridges, and examinations.

No active work was done on account of the available funds being too small to permit it.

Watchman Louis Seidel was on duty at Lock No. 1 throughout the year and has taken excellent care of the plant. A sharp and unusually high rise passed down the river between April 23 and May 2, 1904, and it became necessary to send assistance to the lock. A foreman and 6 men were sent from Gasconade Boatyard and worked 11 days in securing the plant, removing driftwood, and removing property to places of safety, and on account of Watchman Seidel's timely warning nothing was lost or damaged. The highest stage reached during this rise was 23.72 feet above S. L. W. on April 28, 1904.

This extra work was done at a cost of $219.88.

The total expense incurred for the year was $2,470.26.

Two new bridges, namely, the St. Louis, Kansas City and Colorado Railroad bridge, built near Hoecker, Mo., and the Kansas City, Osceola and Southern Railroad bridge, built at Osceola, Mo., were measured and found to agree satisfactorily with the approved plans. Longitudinal sections of the bridges, showing measurements taken, are on file.

In accordance with act of Congress approved March 4, 1904, declaring the head of navigation to be at Warsaw, the bridge at Osceola is now beyond the jurisdiction of this office.

A trip of inspection by skiff was made over the river from Linn Creek, Mo., to its mouth June 11 and 12, 1904, and a special report submitted to you under date of June 15, 1904.

The lock, as it stands, is a menace to navigation and should either be completed or removed. The longer it is left in an incomplete state, the more will be the expenditure required for its completion.

Very respectfully,

W. R. DeWitt,
Assistant Engineer.

Maj. H. M. Chittenden,
Corps of Engineers.

A A 3.

IMPROVEMENT OF GASCONADE RIVER, MISSOURI.

The act of June 13, 1902, appropriated the sum of $10,000 for the Gasconade River. A project for its expenditure, approved by the Chief of Engineers, July 26, 1902, provided for two seasons' work, to consist of removal of snags and other obstructions, the building of wing dams, and doing such other work as would yield immediate benefit to the channel.

During the past season operations have been carried on at Bumpus Island, Sand shoals, Freedom Warehouse, Hensleys shoals, Deppes shoals, Catfish shoals, Priors Island, Brandts Island, Woodpecker shoals, and Stake shoals. The boating channel was cleared of snags and wreck heaps, and all overhanging trees were trimmed or felled. Attention is invited to the accompanying report of Mr. DeWitt upon the operations of the past season.

The work on this river is undoubtedly of a good deal of benefit to navigation, and should be provided for in future as it has been in the past.

Money statement.

July 1, 1903, balance unexpended		$6,427.60
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902		1,000.00
		7,427.60
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$1,384.10	
For maintenance of improvement	4,129.44	
		5,513.54
July 1, 1904, balance unexpended		1,914.06
July 1, 1904, outstanding liabilities		2.00
July 1, 1904, balance available		1,912.06
Amount (estimated) required for completion of existing project		Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$10,000.00	
For maintenance of improvement	10,000.00	
		20,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS AND ALLOTMENTS.

Act of—	
June 14, 1880	$5,000
March 3, 1881	10,000
August 2, 1882	10,000
July 5, 1884	5,000
August 5, 1886	7,500
August 11, 1888	5,000
September 19, 1890	4,000
July 13, 1892	4,000
August 18, 1894	$5,000
June 3, 1896	5,000
March 3, 1899	15,000
June 13, 1902	10,000
Allotted by Secretary of War from act of June 13, 1902	1,000
Total	86,500

COMMERCIAL STATISTICS, GASCONADE RIVER.

The steamboat traffic was carried on by the steamer *Buck Elk.*

TABLE 1.—*Close approximation to the amount of river trade during 1903.*

Class.	Grain.	Live stock.	Lumber and wood.	Railroad ties.	Building material.	General merchandise, farm machinery, etc.	Total.	Mile-tons.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	
Packets	196	15	10	....	2	24	247	9,139
Rafts	....	....	....	10,541	....	....	10,541	691,500
Total	196	15	10	10,541	2	24	10,788	700,639

TABLE 2.—*Comparative statement of the commerce of the river trade from 1903 to 1896.*

Shipments.	1903.	1902.	1901.	1900.	1899.	1898.	1897.	1896.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Grain and hay	196	4,446	2,437	4,796	2,100	1,667	1,467	3,197
Live stock	15	167	485	255	414	708	686	1,131
Lumber, wood, and railroad ties	10,551	28,305	14,869	15,504	19,864	27,134	27,614	40,350
Building material	2	9,845	418	166	6	320	69	493
General merchandise, farm machinery, etc	24	1,617	1,251	859	1,875	1,152	679	1,123
Total	10,788	44,380	19,460	21,580	24,259	30,981	30,515	46,294

TABLE 3.—*Comparative commerce of the river, expressed in mile-tons, during the years 1903 to 1896.*

Class.	1903.	1902.	1901.	1900.	1899.	1898.	1897.	1896.
Packets	9,139	1,231,183	369,223	236,992	307,376	162,594	179,777	229,215
Rafts	691,500	2,508,270	1,347,300	1,187,280	1,079,753	1,669,669	2,030,125	3,293,060
Total	700,639	3,739,453	1,716,523	1,424,272	1,387,129	1,832,263	2,209,902	3,522,275

REPORT OF MR. W. R. DEWITT, ASSISTANT ENGINEER.

SIOUX CITY, IOWA, *June 30, 1904.*

MAJOR: I have the honor to submit the following report of operations on Gasconade River for the fiscal year ending June 30, 1904:

The project for the improvement of this stream, adopted in 1880, contemplated the removal of snags from the channel and of overhanging trees from the banks of the river where necessary and the construction of wing dams and training walls to concentrate the flow of water upon the shoals to increase the depth at those places.

On July 1, 1903, the available cash balance of the current appropriation amounted to $6,426.06.

A personal examination of the river was made between August 16 and 19, 1903, and a project for the improvement for the current fiscal year was made under date of August 19, 1903, which was approved by your telegram of August 22, 1903, and measures were immediately taken to begin operations.

The project submitted included repair work to all existing works between Pointer Creek and the mouth, a distance of 46 miles, construction of several new dams where found expedient during the progress of the work, and the removal of snags and overhanging trees.

The necessary plant was repaired and assembled at the Gasconade boat yard between the dates of August 19 and August 27, 1903, and on the morning of August 28 the steamer *Buck Elk*, which had been chartered for the purpose, was cleared from Gasconade with the plant in tow. After some difficulty in pulling the tow over the shoal places by means of the steamer's capstan, the outfit arrived at Bumpus Island, 37 miles from the mouth, on September 1, 1903, and active operations begun.

The work at Bumpus Island consisted of one dam across Bumpus Island chute, 125 feet long, 55 feet of its length being from 3 to 5 feet deep, the remainder being 1 foot 6 inches deep. Opposite Bumpus Island a chute behind a bar was closed with a dam 55 feet long and from 1 to 5 feet deep.

At Sand shoals two dams were built, one on the right and the other on the left bank of the river. The one on the right bank is 150 feet long, extending 75 feet from the bank to the channel, where it makes a turn and runs a distance of 75 feet downstream parallel with the current. This dam is from 2 to 4 feet deep. The dam on the left bank is 240 feet long, extending 190 feet from the bank, at an angle of about 35° from the shore line, where it makes a turn downstream and runs parallel with the current a distance of 50 feet. This dam is from 2 to 4 feet deep. Facines were placed just under the root of this dam to protect the bank from erosion by an eddy formed at that point when the water at a certain stage flowed over the top of the dam. There is an open channel between these dams of 150 (estimated) feet. A crevice 15 feet wide in the old dam at the head of Pryors Island was closed with brush and stone.

At Freedom Warehouse one dam was built 221 feet in length. It extends 121 feet from the left bank to the channel, at an angle of about 50°, when it makes a turn downstream, running 100 feet parallel with the current. This dam is from 3 to 4½ feet deep. The open channel is estimated to be about 100 feet wide.

At Hensleys shoals an extension of 64 feet was built to the old dam connecting the dam with the bar below. This extension is from 1½ to 4½ feet deep. The low places in the old dam were also restored to grade.

At Deppes shoals the old dam was found intact, but was below grade and was raised 1 foot throughout its entire length. This dam is 510 feet long.

At Catfish shoals a break in the old dam, 62 feet long by 9 feet deep, was closed. There was also built across the bar at the head of the old dam an extension 144 feet by from 1 to 2 feet deep to the main bank. All low places in the old dam were raised to grade. One hundred and fifty feet of the training dam was raised 6 inches.

At Brandts shoals a break in the old dam, 33 feet long by 5 feet deep, was closed.

At Woodpecker shoals the main dam, 1,019 feet long, was raised from 6 inches to 1½ feet to grade. Forty feet of the lower end of the training dam was strengthened by a row of stakes 3½ feet outside the dam, and framed together with poles and cross logs and filled with brush and stone to protect the dam from being undermined by the current. The auxiliary dam, 180 feet long, was raised from 6 inches to 1 foot, and a break of 60 feet by 2½ feet deep was closed.

At Stakes shoals the dam was raised 1 foot throughout its entire length of 396 feet. A break 50 feet in length in the training dam was closed. Fascines were placed just under the root of the main dam to protect the bank from cutting.

The work done by the steamer *Buck Elk*, with a small crew, consisted of removing snags and other obstructions from the channel of the river, cutting overhanging trees, and moving the working plant from point to point as the progress of the work required. A pair of sheer legs, with blocks and tackle, was erected on the steamer's bow to be used in snagging and proved most effective in removing logs from the channel, some old logs being removed that had been a menace to navigation for years and which other means formerly used in this work had not been effective in removing.

Statement of work accomplished by steamer Buck Elk, and small crew.

Snags removed	130
Overhanging trees cut	332
Submerged stumps removed	24
Submerged rocks removed	3
Old piles removed	14
Piles cut off	17
Wrack heaps removed	5
Stumps on bar removed	3

The season's work was brought to a close December 5, and the plant and tools were taken to the boat yard and stored for the winter.

The expenditures for the season were as follows:

Snagging	$1,688.51
Care and repair of plant	541.40
Expenditure at—	
Bumpus Island	453.57
Sand shoals	601.39
Freedom warehouse	329.14
Hensley shoals	212.59
Deppes shoals	180.00
Catfish shoals	398.30
Priors Island	36.09
Brandts Island	138.68
Woodpecker shoals	594.75
Stakes shoals	421.89
	[a] 5,596.31

The total expenditure for the season amounted to $5,513.54, leaving a cash balance on hand July 1, 1904, of $914.06.

Two new bridges recently built across this stream, namely, the St. Louis, Kansas City and Colorado Railroad bridge, at Gascondy, Mo., and a wagon bridge at Rollins Ferry, Missouri, were measured and found to have been built in accordance with the approved plans. Longitudinal sections of these two bridges with measurements shown as taken are on file.

Very respectfully,

W. R. DeWitt,
Assistant Engineer.

Maj. H. M. Chittenden,
Corps of Engineers.

A A 4.

PRELIMINARY EXAMINATION OF KAW (KANSAS) RIVER, KANSAS, AT OR NEAR ITS MOUTH.

[Printed in House Doc. No. 82, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith, for transmission to Congress, copy of report dated February 17, 1903, by Capt. H. M. Chittenden, Corps of Engineers, on preliminary examination of Kaw (Kansas) River, Kansas, made in compliance with a requirement in the river and harbor act approved June 13, 1902.

It is the opinion of Captain Chittenden, concurred in by the division engineer, Col. O. H. Ernst, Corps of Engineers, that the locality is at present not worthy of improvement by the General Government, and the Board of Engineers for Rivers and Harbors, organized under the provisions of section 3 of the above-mentioned act, which has examined and reviewed this report, as required by section 14 of said act, reports in fourth indorsement thereon that it is not desirable that the United States should undertake the improvement of Kaw River at or near its mouth.

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[a] Includes $82.77, cost of spikes and nails on hand.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF CAPT. H. M. CHITTENDEN, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Sioux City, Iowa, February 17, 1903.

GENERAL: I have the honor to submit the following report upon a preliminary examination of the Kaw (Kansas) River, Kansas, ordered by the river and harbor act of June 13, 1902:

Navigation upon this stream is shut off absolutely by railroad and highway bridges, the first of which occurs 1,200 feet above the mouth of the river.

There are only two uses to which the portion of the river below the bridges can be put that have any bearing upon questions of navigation:

(*a*) The loading and unloading of cargoes coming from or going to the Missouri River. There is at present no probability of any such use in the near future.

(*b*) The use of the stream as a winter harbor for river boats, and particularly for the Government fleet doing work along the river. The difficulties in the way of this use condemn it. The river now receives the sewage of Kansas City, and at low water is in a condition that would make it very objectionable as a harbor. The land on its shores is very valuable and is of more importance for municipal purposes than it would be for boat yards. It is not believed that this consideration merits serious attention.

There is no public demand whatever for the improvement of the stream as a navigable waterway, and I therefore report it as at present unworthy of improvement by the General Government.

Very respectfully, your obedient servant,

H. M. CHITTENDEN,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
February 21, 1903.

Respectfully referred to Lieut. Col. O. H. Ernst, Corps of Engineers, division engineer, northwest division, for his views and recommendations.

To be returned.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

[Second indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,
Chicago, Ill, February 26, 1903.

Respectfully returned to the Chief of Engineers.

The act of June 13, 1902, calls for the examination of the "Kaw River at or near its mouth."

The stream is without commercial importance.

I concur in the opinion that its improvement is not advisable.

O. H. ERNST,
Lieut. Col., Corps of Engineers,
Division Engineer, Northwest Division.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
March 3, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

Additional information has been called for, if available.

By command of Brig. Gen. Gillespie:

A. MACKENZIE.
Colonel, Corps of Engineers.

[Fourth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., April 9, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of the district officer and the indorsement of the division engineer thereon.

This river has little or no commerce, either local or general. Upon the Missouri River, which is many times larger than the Kaw, and to which the latter is tributary, the expenditure of large sums for improvement has not resulted in the development of any considerable commerce. The Board is of the opinion that the improvement of the Kaw would result in no transportation route of value commensurate with the cost, and, furthermore, that the existing bridges near the mouth of the Kaw, the great value of real estate in the vicinity, and the slight commercial demand for such increased facilities render inadvisable the improvement of the mouth of the river for local harbor purposes.

For these reasons the Board believes that it is not desirable that the United States should undertake the improvement of Kaw River at or near its mouth.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

A A 5.

EXAMINATION OF MISSOURI RIVER BETWEEN ITS MOUTH AND SIOUX CITY, IOWA, INCLUDING THE SECTIONS AT AND NEAR HERMANN, WEST GLASGOW, WILHOITE BEND, LEXINGTON, AND ST. JOSEPH, MISSOURI.

[Printed in House Doc. No. 441, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, January 15, 1904.

Sir: I have the honor to submit herewith, for transmission to Congress, report dated October 26, 1903, by Capt. H. M. Chittenden, Corps of Engineers, on examination authorized by section 1 of the river and harbor act approved June 13, 1902, of Missouri River from Sioux City, Iowa, to the mouth of the river, with a view to ascertaining whether navigation can be obtained at a reasonable cost by dredging and the removal of obstacles; also at and near Hermann, West Glasgow, Wilhoite bend, Lexington, and St. Joseph, with a view to ascertaining what improvements in these localities, if any, are necessary for navigation.

Captain Chittenden's report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided by section 3 of the act of June 13, 1902, and attention is respectfully invited to its report of January 4, 1904, in seventh indorsement thereon. The Board has very carefully reviewed all the features involved in the treatment in the interests of navigation of the Missouri River from Sioux City to the mouth, including the various localities named in the act, and concludes its report as follows:

> To sum up, in the matter of the Missouri River between Sioux City, Iowa, and its mouth, the Board recommends:
>
> (1) That it is advisable to provide for snagging operations by means of a permanent appropriation of $35,000 annually, but the amount available for each of the next two years should be $50,000.
>
> (2) That navigation can not be secured at reasonable cost by means of dredging.
>
> (3) That no improvements are necessary for navigation, or advisable, at and near West Glasgow, Wilhoite bend, Lexington, or St. Joseph.
>
> (4) That it is advisable in the interests of navigation to undertake improvements at and near Hermann, at a cost of $10,000.

I concur in the views and recommendations of the Board.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF CAPT. H. M. CHITTENDEN, CORPS OF ENGINEERS.

United States Engineer Office,
Sioux City, Iowa, October 26, 1903.

General: I have the honor to submit herewith a report upon examinations required by act of Congress of June 13, 1902, at the following points:

(1) Missouri River between mouth and Sioux City, "with a view to ascertaining whether navigation can be obtained at a reasonable cost by dredging and the removal of obstacles;" (2) Hermann; (3) West Glasgow; (4) Wilhoite Bend; (5) Lexington; (6) St. Joseph.

In regard to the practical value of snagging operations on the Missouri River there is no doubt. Snags are the most formidable danger to the navigation of that stream. The recent flood has brought into the channel a great many new snags, and their complete removal will be a matter of several seasons' work.

In the matter of dredging operations it has not been practicable, on account of cost, to equip a dredge boat for experiment in maintaining a channel over shallow bars; and the high water of the past two seasons has made operations of that kind unnecessary. The entire distance from Kansas City to the mouth of the river was traversed by the Government snag boat *McPherson* in October of both 1902 and 1903, without being stopped once by shallow water. There is, however, no question of the feasibility of sluicing or dredging channels across the bars in low water, and it is believed that a combined dredge and snag boat could be devised which would be very effective in maintaining a navigable depth in the low-water season.

An estimate of $50,000 was submitted in my last annual report for snagging. At that time the effect of the great flood of last May and June was not known, and a recent low-water inspection of the river has disclosed so many new snags that it is important to increase this estimate until the river is restored to its normal condition. I would therefore recommend that the estimate of $50,000 for the next two years be doubled.

HERMANN, MO.

Hermann is the center of a considerable river trade, which embraces the Gasconade and Osage rivers and the Missouri for a distance up and down of about 50 miles. The conformation of the bluff shore on the south bank is such that the river tends to leave it in the vicinity of Hermann, and that port has often suffered from silting up in recent years. The river divides opposite the town, a considerable portion going behind an island. It would remedy the condition at Hermann if the chute behind the island could be closed by a dike, so that the entire stream should flow along the right bank.

In connection with this work, however, it would be important to close the chute between Bates Island below town and the south shore, forcing the whole river through the main channel on the north side of the island, thus making the course of the river on leaving Hermann conform naturally with that approaching town. This would necessitate a strong dike to close the chute and the revetment at the head of Bates Island.

The dike would have to be very heavy—four-row—and the total length would not be less than 2,000 feet. Its cost at $10 per foot would be $20,000. The revetment at the head of the island would be about 4,000 feet long and would cost $40,000. The total cost of the improvement is estimated at $60,000. It all applies strictly to the interests of navigation on a portion of the river where commercial boating is of considerable importance.

GLASGOW, MO.

The course of the river just below Glasgow, Mo., is around a very sharp bend from a direction nearly east to one slightly west of south. The bend is already sharper than it should be for practical navigation.

The tendency of the river has been for years to erode the right bank upstream from this curve for a distance of upward of 4 miles. The Chicago and Alton Railroad has stopped this erosion for a distance of over 2 miles where their line lies close to the river along the upper portion of the stretch described. It is important for the maintenance of the navigable channel that the remainder of this distance be also held from further cutting, both for the purpose of preventing a sharper curvature around the bend and of maintaining sufficient distance between the bend and the railroad bridge to permit boats to make the approach to the bridge, about half a mile below, with ease and safety.

The length of bank requiring revetment is about 10,000 feet, which, at the standard estimate of $10 per foot, covering all expenses, would be $100,000.

WILHOITE BEND.

The channel of the river in Wilhoite Bend is in very bad shape. The heavy dike put in between bank heads 5C and 6C had the effect, during the recent flood, of turning the current strongly inshore into a low swale extending across the country to the Chariton River. It cut away the right bank, which formerly acted as a levee against high water and has now left the bank so low that ordinary high water threatens to open a new channel along this line of low ground. Already cutting has begun in several places.

The bank head just below this dike now amounts practically to an obstruction in the river. It juts out as a sharp point, forcing the river entirely out of its regular course, and develops a current around the point which amounts almost to a torrent. The whole situation could scarcely be worse than it is from the point of view of navigation, while the works themselves have created dangers to the neighboring lands which did not exist before.

A levee should be built from the dike above mentioned to the bank head 6C, to restore, as far as possible, the original condition as regards overflow. The bank head, now partially destroyed, should be allowed to go, and the point be eroded back until a fair shore line is developed, when it should be secured by standard revetment, which should be extended to a safe distance above and below.

The levee work would be but a small item, estimated not to exceed $2,000.

The bank revetment should cover a distance of not less than 7,200 feet, which, at the standard estimate of $10 per foot, covering all expenses, would be $72,000. Some expenditures will be required to remove obstructions caused by existing works, and the total sum of $75,000 is estimated for the entire improvement at this point. This would rectify and secure the bank from the upper bank head 4C to a point about 1,000 feet below the lower bank head 6C.

LEXINGTON, MO.

A recent examination of the river in the vicinity of Lexington, Mo., does not indicate the necessity of any immediate extensive work at that point in the interest of navigation exclusively.

ST. JOSEPH, MO.

The Government has done nearly $1,000,000 worth of work in the vicinity of St. Joseph. It consists nearly all of standard revetment, with the addition of one longitudinal dike and one heavy dike at the lower end of the work, built at an oblique angle with the channel. The revetment commences on the left bank of the river several miles above St. Joseph, in the vicinity of the city waterworks, and continues for a distance of nearly 20,000 feet. Commencing about a mile below this revetment and on the right bank of the river is another revetment in Belmont and Elwood bends, of about the same length as the first. This makes about 7½ miles of revetment work, all of which is above town. Below town there is about a mile and a half of similar work on the left bank of the river. Immediately above this latter work the harbor line of the city commences and the city can be depended upon to care for the river within its limits.

There should, however, be some work done to connect the lower end of the Elwood Bend revetment and the upper end of the city harbor line. It should consist of a longitudinal dike to cut off the chute on the right bank of the river, and standard revetment along the left bank, extending from the harbor line about 7,500 feet upstream. The length of the longitudinal dike on the right bank will be about 2,500 feet, making a total of about 10,000 feet of improvement work. Both dike and standard revetment are estimated to cost $10 per running foot, which would make a total expenditure of $100,000 for this improvement. This would connect the existing revetment above town with the upper end of the harbor line, which at the lower end connects with the Government work below town, making a continuous improvement of about 15 miles.

In addition to this new work it is of the utmost importance that the existing revetment receive sufficient repairs to maintain it in good condition. Some of the work is very old, having been built before the Missouri River Commission took charge of the work. There have been several breaks in the revetment, which have been repaired from time to time, but the funds available for repairs have never been sufficient to make as thorough repairs as are necessary. It is estimated that at least $100,000 should be expended on the Government works in this vicinity to put them in a state of thorough efficiency and repair. This makes a total estimate for maintenance and repairs and for new work in the vicinity of St. Joseph, $200,000.

Very respectfully, your obedient servant,

H. M. CHITTENDEN,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

OFFICE DIVISION ENGINEER, NORTHWEST DIVISION,
Chicago, Ill., October 28, 1903.

Respectfully forwarded to the Chief of Engineers.

Provision for these examinations is found in the item of the river and harbor act of June 13, 1902, appropriating money for the improvement of the Missouri River. They do not come under the general instructions for preliminary examinations contained in section 14 of that act, but in the case of the Calumet River examination, for which provision was made in a similar manner, the Chief of Engineers directed the officer in charge to submit a plan and estimate, giving also his opinion whether or not improvement to the extent outlined is a work worthy to be undertaken by the United States. This report does not contain such opinions, except as to snagging, nor does it contain facts and figures upon which such opinions can be based.

Dredging in the Missouri River for general navigation purposes, in my judgment, should not be mentioned except in terms of condemnation.

O. H. Ernst,
Colonel, Corps of Engineers,
Division Engineer, Northwest Division.

[Sixth indorsement.]

War Department,
Office of the Chief of Engineers,
Washington, November 16, 1903.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, series of 1902, for consideration and recommendation.

By order of the Acting Chief of Engineers:

H. F. Hodges,
Major, Corps of Engineers.

[Seventh indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., January 4, 1904.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has reviewed the within report of the district officer, submitted in accordance with the will of Congress as expressed in the river and harbor act of June 13, 1902, following the item making appropriation for the Missouri River between Sioux City, Iowa, and its mouth:

> And the Secretary of War shall cause an examination to be made of said portion of said river with a view to ascertaining whether navigation can be obtained at a reasonable cost by dredging and the removal of obstacles; also at and near Hermann, West Glasgow, Wilhites [Wilhoite] Bend, Lexington and St. Joseph, with a view to ascertaining what improvements in these localities, if any, are necessary for navigation.

The indorsement of the division engineer and other data have been duly considered.

The available depth on this stretch of river varies during low-water seasons from about 2 to 3 feet. The presence of snags, of which there is a constantly renewed supply, renders navigation at times dangerous, and at low stages often obstructs and makes unavailable the deepest water.

With reference to the question "whether navigation can be obtained at a reasonable cost by dredging and the removal of obstacles," the Board believes that snagging operations afford the only practical and feasible method of assisting through navigation on the Missouri River at a reasonable cost. The amount of sand in motion and the extreme instability of dredged channels in the Missouri River forbid belief that dredging on a sufficient scale to be of material service to navigation could be carried on at a cost at all commensurate with resulting advantages to commerce. No more is to be expected from snagging than that it will materially add to the safety of navigation and make available for light-draft vessels such depths as naturally exist. Without snagging the small commerce now existing would within a few years dwindle away and finally be abandoned. The following is a quotation from the last report of the Missouri River Commission:

> A general provision for operating snag boat upon the Missouri River is recommended, similar to the provisions made for other rivers, so that the Secretary of War may be authorized to draw his warrant or requisition from time to time upon the Secretary of the Treasury for such sums as may be necessary to do such work, not to exceed in the aggregate for each year the sum of $35,000.

The Board indorses this suggestion, and desires also to indorse the recommendation herein that for each of the next two years there be provided for snagging operations $50,000. The larger amount is needed in the immediate future because of an accumulation of snags due to unprecedented floods.

Having in mind the fact that some of the work upon which large sums have been expended under the late Missouri River Commission in prosecution of its plan for a systematic improvement of the river is incomplete, and that all of it is naturally subject to deterioration or loss, consideration has been given to the advisability of completing or maintaining any of such works. It is obvious that no benefits worth the cost would follow the maintenance of short improved reaches, disconnected with each other or with the mouth of the river. This being the case, it follows that it is inadvisable to maintain, by continuing expenditures, works that have been built for the rectification of such reaches. And the Board believes this to be true, even if, due to changes that can not all be now foreseen, the systematic improvement of the Missouri is at some unknown future time to be resumed. Of the nature of additions to or maintenance of works heretofore executed are the improvements contemplated in the act at St. Joseph and Wilhoite. The Board does not consider works at these points advisable.

The Board has also considered the advisability of improving certain localities where now or hereafter existing navigation may be jeopardized by changes in the river bed which injure or threaten to destroy important harbors or landings. Of such a character is the improvement contemplated at or near Hermann, Mo. This town is at present perhaps the most important steamboating point on the river. Several boats make this their headquarters, whence they make fairly regular trips up the Osage and Gasconade rivers, and for a distance of about 50 miles up and down the Missouri River. Unless these boats can land within a reasonable distance of the center of business in Hermann, their trade will be materially lessened and greatly inconvenienced.

Owing to the conformation of the shore line above the town, the harbor often silts up and the steamboat landing is destroyed. To overcome this the district officer recommends certain work which he estimates will cost $60,000. In answer to a query from the Board the same officer reports that of this amount $10,000 is required for a dike closing a chute opposite Hermann, and the balance for work below that town. Comparing the proposed expenditure with the commerce involved, the Board is of opinion that this locality is worthy of improvement by the United States to the extent of closing the chute opposite Hermann at a cost of $10,000.

The improvements contemplated at and near West Glasgow and Lexington, Mo., appear to fall in neither class above described. No commercial benefits commensurate with the cost would, in the opinion of the Board, result from expenditures at either locality; consequently the Board believes that it is not desirable that the United States should undertake the work.

To sum up, in the matter of the Missouri River between Sioux City, Iowa, and its mouth, the Board recommends:

(1) That it is advisable to provide for snagging operations by means of a permanent appropriation of $35,000 annually, but the amount available for each of the next two years should be $50,000.

(2) That navigation can not be secured at reasonable cost by means of dredging.

(3) That no improvements are necessary for navigation, or advisable, at and near West Glasgow, Wilhoite Bend, Lexington, or St. Joseph.

(4) That it is advisable in the interests of navigation to undertake improvements at and near Hermann, at a cost of $10,000.

For the Board:

Chas. J. Allen,
Lieut. Col., Corps of Engineers,
Senior Member of the Board.

A A 6.

ESTABLISHMENT OF HARBOR LINES ALONG MISSOURI RIVER AT ST. JOSEPH, MISSOURI.

United States Engineer Office,
Sioux City, Iowa, October 16, 1903.

General: I have the honor to submit the following report upon the establishment of a harbor line along the Missouri River front of the city of St. Joseph, Mo., and to recommend that the line shown and described on the accompanying map[a] and notes be adopted as the harbor line for the city.

The instructions contained in second indorsement upon the letter of Hon. C. F. Cochran, M. C., asking for the establishment of a harbor line for the city of St. Joseph, were carefully observed in every particular. A public hearing was widely advertised and was held in the city hall of St. Joseph April 27, 1903. It was largely attended. No objection was offered to the establishment of a line, and that finally determined upon meets the approval of all parties concerned. It is also as good a line as can be adopted in the interests of navigation of the river.

Accompanying this report are a map of the harbor line, notes descriptive of same, and a copy of the minutes[a] of the public hearing.

Very respectfully, your obedient servant,

H. M. CHITTENDEN,
Captain, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[Fourth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, January 4, 1904.

Respectfully submitted to the Secretary of War.

Upon request of Hon. Charles F. Cochran, the question of establishing harbor lines on Missouri River at St. Joseph, Mo., has been under consideration by the Department.

The matter has been thoroughly investigated by the local engineer officer, Captain Chittenden, and a public hearing has been held, at which no objection was made to the proposed line. The line selected is delineated upon the accompanying tracing[a] and described in a separate paper.

Concurring in the views of the local officer, I recommend that the harbor line presented be approved and that the Secretary place his approval upon the tracing and description, both of which have been prepared for his signature.

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

DESCRIPTION OF HARBOR LINE IN THE MISSOURI RIVER AT ST. JOSEPH, MO.

Table showing position of points referred to rectangular axes through the secondary △ St. Joe, the axes being the meridian and the tangent to the parallel through that point. All azimuths are referred to this meridian, considering the south point as zero.

It is intended that the points N, L, F, A, C, and 1 be located from points on the city streets, as shown on this map, in order that any discrepancies may be confined between contiguous points of the above-mentioned line.

	Latitude.	Departure.	
	Feet.	*Feet.*	
△ St. Joe	0	0	Secondary △ Missouri River Commission.
△ Wathena	South 20,373	West 23,073	Do.
	South 32,823	East 2,809	Monument on Kings Knob.
N	South 14,075	East 1,580	
L	South 14,947	East 2,010	
F	South 16,979	East 3,014	
A	South 20,384	East 3,497	
C	South 23,173	East 2,996	
△ 1	South 25,556	East 2,073	Piece of steel rail.
M	South 14,065	East 1,603	Do.
K	South 14,945	East 2,298	
E	South 17,040	East 3,521	
△ 2	South 23,172	East 3,345	
O	South 12,571	West 2,101	

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[a] Not printed.

Detailed description of points in harbor-line survey, by which latter is connected with city survey for convenience in practically locating position of harbor line.

[Manner of obtaining street lines and intersections is shown on map.]

	Azimuth.		Distance.	Description.
	°	′	*Feet.*	
H to K	89	31	592.4	H is on center line of main street 25 feet northerly from center of Jule street.
K to L	89	31	287.5	K is 25 feet northerly from center of Jule street.
L to N	153	44	973.0	L is a point on harbor line.
N to M	243	44	24.0	N is a point on harbor line; M is marked by piece of steel rail 7.4 feet southwesterly from center of west track of Kansas City, St. Joseph and Council Bluffs Railway.
N to O				Circular curve on harbor line; radius, 3,000 feet; azimuths of radii from center to tangent point, 243° 44′ and 160° 44′; central angle, 83° 00′; length of long chord, 3,975.7 feet; azimuth, 112° 14′.
L to F	333	44	2,268.0	F is a point on harbor line.
D to E	89	47	490.0	D is on center of Fourth street and 25 feet southerly from center of Mesanie street.
E to F	96	54	510.0	E is 25 feet southerly from center of Mesanie street.
F to A				Circular curve on harbor line; central angle, 36° 26′; azimuths of radii from center to tangent points, 280° 10′ and 243° 44′; the former coincides with center line of railroad bridge; radius, 5,500 feet; A is on center line of railroad bridge and at center of pier at east end of draw span.
A to C	10	10	2,834.0	
B to △ 2	89	51	1,378.0	B is on center of Sixth street and 2.5 feet southerly from center of Hickory street.
△ 2 to C	89	51	349.0	△ 2 is 2.5 feet southerly from center of Hickory street.
C to △ 1				Circular curve on harbor line; radius, 6,687 feet; azimuths of radii from center to tangent points, 280° 10′ and 302° 12′; central angle, 22° 02′; length of long chord, 2,556 feet; azimuth, 21° 11′.

[First indorsement.]

WAR DEPARTMENT, *January 5, 1904.*

Approved.

E. ROOT, *Secretary of War.*

APPENDIX B B.

IMPROVEMENT OF CUMBERLAND RIVER, TENNESSEE AND KENTUCKY, AND OF OBION AND FORKED DEER RIVERS, TENNESSEE.

REPORT OF LIEUT. COL. CLINTON B. SEARS, CORPS OF ENGINEERS, OFFICER IN CHARGE, FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS.

IMPROVEMENTS.

1. Obion and Forked Deer rivers, Tennessee.
2. Cumberland River, Tennessee and Kentucky.

EXAMINATIONS.

3. Hatchee (Big Hatchie) River, Tennessee.
4. Obion and Forked Deer rivers, Tennessee.

Engineer Office, United States Army,
Nashville, Tenn., July 18, 1904.

General: I have the honor to transmit herewith the annual report * * * upon the river improvements in my charge relating to the Nashville, Tenn., district for the fiscal year ending June 30, 1904.

Very respectfully,

Clinton B. Sears,
Lieut. Col., Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

B B 1.

IMPROVEMENT OF OBION AND FORKED DEER RIVERS, TENNESSEE.

A detailed description of the Obion River, plans for improvement, previous project, and modifications of same are given in the Annual Report of the Chief of Engineers for 1896, pages 1897 et seq., and same report for 1897, pages 2217 et seq., and of the Forked Deer River, pages 1900 et seq., ibid.

Obion River.—During fiscal year the snagging outfit was repaired and working party sent out, which was engaged in the work below stated from September 15, 1903, to November 13, 1903, inclusive, 69 miles of river being cleared.

Details of the work are as follows:

Snags removed	1,307
Snags cut	2,239
Logs cut	1,536
Leaning trees cut	1,790
Trees deadened	1,085

The total expenditures for fiscal year ending June 30, 1904, amount to $2,194.36.

The balance available is to be applied to watching and caring for snagging outfit.

Money statement.

July 1, 1903, balance unexpended	$2,475.69
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	2,194.36
July 1, 1904, balance unexpended	281.33
July 1, 1904, outstanding liabilities	13.00
July 1, 1904, balance available	268.33
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	2,500.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

Forked Deer River.—On November 13, 1903, the snagging party and fleet from Obion River passed into the Forked Deer River and commenced operations the following day. The season's work was closed on January 13, 1904, and fleet moored at Dyersburg, Tenn., in charge of watchman. A distance of 83 miles was cleared.

The details of the work are as follows:

Snags removed	283
Snags cut	1,610
Leaning trees cut	1,454
Trees deadened	614
Logs cut	1,006

The total expenditures during fiscal year ending June 30, 1904, amount to $1,594.55. The balance available is to be applied to watching and caring for snagging outfit.

Money statement.

July 1, 1903, balance unexpended	$1,975.68
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	1,594.55
July 1, 1904, balance unexpended	381.13
July 1, 1904, outstanding liabilities	11.50
July 1, 1904, balance available	369.63
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	2,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

APPROPRIATIONS.

Obion River, Tennessee.

By act of—	
July 13, 1892	$7,500
August 18, 1894	7,500
June 3, 1896	6,000
March 3, 1899 (for maintenance)	2,500
June 13, 1902 (allotment for maintenance)	2,500
Total	26,000

Forked Deer River, Tennessee, and its navigable branches.

By act of—	
August 2, 1882, for South Fork	$3,000
July 5, 1884, for South Fork	2,000
August 5, 1886, for South Fork	5,000
August 11, 1888, for South Fork	2,500
August 11, 1888, for North Fork	4,500
August 11, 1888, for main river	2,500
September 19, 1890, for North Fork and main river	2,500
July 13, 1892, for Forked Deer (completing improvement)	3,000
Total to complete old project	25,000
Present project: By act of—	
June 3, 1896, for Forked Deer River (for maintenance)	1,000
June 3, 1896, for North Fork or Middle Fork from Dyersburg to Mississippi River	5,000
March 3, 1899, for Forked Deer River (for maintenance)	2,000
June 13, 1902 (allotment for maintenance)	2,000
Total	10,000

COMMERCIAL STATISTICS.

Obion and Forked Deer rivers, Tennessee, from January 1 to December 31, 1903.

	Tons.		Tons.
Logs	18,554	Grain	104
Lumber	3,555	General merchandise	126
Spokes	112		
Salt	11	Total tonnage	22,576
Flour	33		
Tobacco	1	Estimated value	$126,651
Live stock	20	Passengers carried (about)	1,650
Hay	60		

List of steamboats (stern-wheel) plying upon Obion and Forked Deer rivers, Tennessee.

[Calendar year 1903.]

Name.	Registered dimensions.			Net tonnage.
	Length.	Breadth.	Depth.	
	Feet.	*Feet.*	*Feet.*	
Vernie Mac	127	24.7	4.9	122
A. R. Hall	72	15.0	11.5	39
Caruthersville [a]				
Sarah [b]	48	8.5	3.2	8
Little George [b]	41	10.0	2.8	6
Monie Bauer	73	17.5	3.0	45

[a] Dimensions not given.

[b] Gasoline.

B B 2.

IMPROVEMENT OF CUMBERLAND RIVER, TENNESSEE AND KENTUCKY.

(A) BELOW NASHVILLE, TENN.

For description of this stream, character of its obstructions, and efforts for its improvement made from 1830 until the adoption of the present project, also for statement of certain examinations and surveys made from 1870 to 1880, see the following reports of the Chief of Engineers: 1871, pages 474 et seq.; 1896, pages 1905 et seq.; 1899, pages 2238 et seq.

The floating plant, constructed under contract (see Annual Report of the Chief of Engineers for 1903, p. 1582), was delivered in January, 1904, and put in commission.

Proposals for construction, delivery, and erection of four pairs of steel lock gates, operating mechanism, and filling valves for Lock A on the lower and Lock No. 1 on the upper Cumberland were readvertised for October 8, 1903 (see Annual Report of the Chief of Engineers for 1903, p. 1582), and contract awarded to the lowest bidder, the Penn Bridge Company, of Beaver Falls, Pa., at $32,950, being for gates with flat plates. Contract was entered into December 4, 1903, and provides for erection of gates in place by September 30, 1904.

Advertisement was made January 14, 1904, for furnishing and delivering about 1,470,000 feet B. M. yellow-pine timber for Dams A and No. 1, and contract awarded to the lowest bidder, W. C. Rodgers, of Hattiesburg, Miss., at $23 per M feet B. M. delivered at Lock A, and $22.50 per M feet B. M. delivered at Lock No. 1, the contract aggregating $33,563.31. Provision was made for 967,660 feet B. M. for Dam A and 502,539 feet B. M. for Dam No. 1. This contract was entered into March 18, 1904, and provided for completion by June 15, 1904, but an application for additional time was made and granted. At the close of the fiscal year nearly all the timber contracted for had been delivered, and construction of the dams will proceed without unnecessary delay. In this work the hired labor method will be used.

During the fiscal year ending June 30, 1904, $48,860.84 were expended, of which $46,788.65 were applied to the work at Lock A and contingencies and $2,072.19 to maintenance and contingencies (the cost of one steam tender being pro rated to maintenance).

The following is a detailed statement of the principal work at Lock and Abutment A during the past fiscal year, work being resumed February 22, 1904:

Stone quarried for riprap	cubic yards	6,000
Stone boated	do	2,400
Dredging below lock	do	4,100
Dredging above lock	do	1,100
Dredging at abutment	do	1,200
Grading and riprapping bank at abutment	do	2,800
Unloading and piling dam timber	feet B. M.	952,022
Fill made for side track	cubic yards	3,500

Miscellaneous work at Lock A consisted in erecting derricks, counter hewing timbers for dipper handles and sills for lock, making scale boards, iron scraper, repairing machinery, etc.

The dredging hereinabove mentioned, 6,400 cubic yards, was done by dredge *No. 1*, first placed in commission in April, 1904, at a cost of 13.6 cents per cubic yard. The dredge is operated by hired labor.

The U. S. S. *Henry*, first placed in commission in March, 1904, towed 6,400 cubic yards of mud and gravel from dredge to dumping place; also engaged in towing miscellaneous supplies and material for Lock A.

The U. S. S. *John*, first placed in commission in January, 1904, and steamer *Cumberland* were engaged while on this section in towing supplies, etc., to and from Lock A.

Steamer *Cumberland* was at Paducah, Ky., from February 13, 1904, to middle of March, 1904, where the vessel was docked and thoroughly overhauled and repaired.

No snagging was done below Nashville, owing to lack of funds.

The Tennessee Central Railroad Company having complied with all conditions precedent to delivery of deed from Secretary of War to said company for 1.07 acres of land at Lock A, said deed was delivered to the railroad company on March 14, 1904. (See Annual Report of the Chief of Engineers for 1903, p. 1582.)

The balance available will be used for the completion of Lock and Dam A. The estimate submitted below of the amount that can be profitably expended in the fiscal year ending June 30, 1906, should be applied to the location and acquisition of the sites of locks and abutments of Dams B, C, and D, and to the commencement of construction of the same.

Money statement.

July 1, 1903, balance unexpended		$149,415.24
Cash deposit taken up, pay due sundry persons uncalled for		3.15
		149,418.39
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$46,788.65	
For maintenance of improvement	2,072.19	
		48,860.84
July 1, 1904, balance unexpended		100,557.55
July 1, 1904, outstanding liabilities		37,477.60
July 1, 1904, balance available		63,079.95
July 1, 1904, amount covered by uncompleted contracts		32,898.82
Amount (estimated) required for completion of existing project		1,534,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$295,000.00	
For maintenance of improvement	5,000.00	
		300,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

Improving Cumberland River, Tennessee and Kentucky, general river, 1832 to 1838.

Act of—	
July 17, 1832	$30,000
June 28, 1834	30,000
July 7, 1836	20,000
March 3, 1837	55,000
July 7, 1838	20,000
Total	155,000

Improving Cumberland River below Nashville, Tenn., under old project for open-channel work, from 1871 to 1890.

Act of—	
March 3, 1871	$30,000
June 10, 1872	20,000
March 3, 1873	25,000
March 3, 1875	25,000
June 18, 1878	45,000
March 3, 1879	40,000
June 14, 1880	20,000
March 3, 1881	15,000
August 5, 1882	$15,000
July 5, 1884	7,500
August 5, 1886	12,500
August 11, 1888	10,000
September 19, 1890	40,000
Total	305,000

Under new project for locks and dams, from 1892 to 1902.

Act of—	
July 13, 1892	$40,000.00
August 18, 1894	30,000.00
June 3, 1896	80,000.00
March 3, 1899	100,000.00
Amended act of June 13, 1902	180,000.00
Total	430,000.00
Received on account of sales	961.95
Cash deposit taken up, pay due sundry persons uncalled for	3.15
Aggregate	430,965.10

CONTRACTS IN FORCE.

Improving Cumberland River above and below Nashville, Tenn.

1. For construction of 1 dredge, at $18,650.
   Contractor: Featherstone Foundry and Machine Company.
   Date of contract: December 15, 1902.
   Date of approval: January 8, 1903.
   Date of beginning work: June 2, 1903.
   Date of expiration: May 1, 1903. (Time limit has been waived, as authorized by the Chief of Engineers, United States Army, April 25, 1903.)
2. For construction of 2 steam tenders, at $4,535 each; 2 dump scows, at $3,650 each; 6 decked barges, at $1,503 each, and 2 derrick-boat hulls, at $1,440 each.
   Contractor: Ed. J. Howard.
   Date of contract: January 26, 1903.
   Date of approval: February 17, 1903.
   Date of beginning work: March 2, 1903.
   Date of expiration: May 1, 1903. (Time limit has been waived, as authorized by the Chief of Engineers, United States Army, April 25, 1903.)
3. For construction, delivery, and erection of 2 pairs of steel lock gates, filling valves, etc., for Lock A, at $17,550; and 2 pairs of steel lock gates, filling valves, etc., for Lock No. 1, at $15,400.
   Contractor: Penn Bridge Company.
   Date of contract: December 4, 1903.
   Date of approval: January 4, 1904.
   Date of beginning work: December 9, 1903.
   Date of expiration: September 30, 1904.
4. For furnishing and delivering 967,660 feet B. M. yellow pine timber for Dam A, at $23 per thousand feet B. M., and 502,539 feet B. M. for Dam No. 1, at $22.50 per thousand feet B. M.
   Contractor: W. C. Rodgers.
   Date of contract: March 18, 1904.
   Date of approval: April 7, 1904.
   Date of beginning work: April 12, 1904.
   Date of expiration: June 15, 1904. (Time limit waived as authorized by the Chief of Engineers, United States Army, June 15, 1904.)

COMMERCIAL STATISTICS.

Cumberland River below Nashville, Tenn., from January 1 to December 31, 1903.

	Tons.		Tons.
Logs	3,795	Coal	4,500
Lumber	3,450	Salt	303
Timber	1,000	Flour	400
Railroad ties	198,843	Produce	1,100
Hoop poles	510	Hay	1,250
Heading	125	Grain	10,658
Spokes	105	Hogs	5,000
Staves	1,000	Horses	200
Shingles	32	Mules	400
Sand	23,337	Cattle	400
Lime	72	Sheep	18
Cement	390	General merchandise	13,850
Bricks	6,100		
Explosives	1,650	Total tonnage	297,438
Crude materials for explosives	1,500	Estimated value	$3,888,305
Tobacco	5,167	Passengers carried	8,000
Iron	12,283		

List of steamboats (stern-wheel) plying on the Cumberland River below Nashville, Tenn., calendar year 1903.

Name.	Registered dimensions.			Net tonnage.
	Length.	Breadth.	Depth.	
	Feet.	*Feet.*	*Feet.*	
Lora	70.0	12.0	2.5	44
Sycamore	103.6	20.3	3.0	69
H. W. Buttorff	160.0	30.0	4.1	160
J. B. Richardson	165.0	29.0	4.0	191
Tenbroeck	130.0	26.0	3.9	148
Lula E. Warren	122.0	22.5	3.3	78
Victor	120.0	26.0	4.0	100
Thos. Parker	100.0	18.1	4.5	57
Penguin	80.0	16.6	3.4	60
Kuttawa (gasoline)	58.0	10.0	2.5	12
I. N. Hook	109.9	19.4	3.0	55
Belle of Calhoun	180.9	36.4	4.7	451
Pavonia	120.0	26.0	4.0	132
J. T. Duffy, jr	120.0	26.0	3.8	146
Inverness	129.0	21.0	4.8	121
Russell Lord	160.0	30.0	5.0	186
Jno. S. Summers	108.2	21.3	3.4	66
Wilford	85.0	18.8	3.0	47
Lyda	120.0	21.4	3.4	92
A. L. Goldberg	129.0	20.0	3.0	58
T. L. Herbert	117.0	24.0	3.6	80
Victoria	96.3	28.0	10.4	116
Henrietta	130.0	24.0	4.3	153
Dick Clyde	95.8	17.4	3.9	76
Lotus Sims (side wheel)	240.0	66.0	5.8	665

(B) ABOVE NASHVILLE, TENN.

The distance from Nashville to Cumberland Ford (Pineville) is about 497 miles, and from Nashville to head of Smith Shoals, mouth of Rockcastle River, is 357 miles. The head of navigation is at Burnside, Ky., 325 miles above Nashville, Tenn., with a fall of 223 feet.

A general description of the upper Cumberland, showing the character of its obstructions and of its navigability for steamboats, is given in Report of the Chief of Engineers, 1896, page 1909.

For detailed description of Cumberland River above Nashville see Reports of the Chief of Engineers, 1871, pages 468–485; 1872, pages 462–472.

The amount expended under existing project during fiscal year ending June 30, 1904, is $90,986.38; of this amount $29 was a Treasury settlement, the disbursements being classified as follows:

General improvement:		
Lock No. 1	$25,509.30	
Lock No. 2	231.61	
Lock No. 3	27,536.77	
Lock No. 4	23,978.34	
Lock No. 5	3.71	
Channel work	2,700.57	
		$79,960.30
Lock Nos. 5, 6, and 7 (floating plant prorated):		
Lock No. 5	3,676.28	
Lock No. 6	3,333.34	
Lock No. 7	3,333.33	
		10,342.95
Locks and Dams Nos. 1, 5, 6, and 7:		
Lock No. 5	29.78	
Channel work	653.35	
		683.13
		90,986.38

Operations were carried on at the following localities:

Lock No. 1.—For statement regarding proposals solicited and contracts let for lock gates and dam timbers see page 2340. Active operations were resumed here April 1, 1904, and force since then employed principally in work preparatory to putting in dam. Three temporary wooden buildings were erected, viz, blacksmith's shop, laborers' quarters, and building for kitchen and dining room; also one permanent brick storehouse. Shed for machinery was also erected. A rock fence, to replace old wooden fence at Lock 1, is also in course of construction. Quantities are as follows:

Stone quarried	cubic yards	414
Earth excavated	do	300
Quarry stripped	do	100
Riprap quarried	do	79
Bank riprapped	do	60
Stone foundation for storehouse laid	do	100
Rock fence laid	do	306
Dredging foundation for dam	do	6,960
Timber for dam received and piled	feet B. M.	513,053

Dredging was done by dredge boat *No. 1* at a cost of 10.8 cents per cubic yard.

Lock No. 3.—The principal work done was completing abutment, building retaining wall to protect lower approach to lock, and grading and riprapping banks of abutment and lower approach to lock. Abutment was built of concrete. In addition to this work, all temporary buildings were made level and braced, quarters, kitchen, and blacksmith shop reshingled, bins constructed for sand and gravel, brick flues built in quarters, etc. Quantities are as follows:

	Cubic yards.
Abutment:	
Excavation	10,822.5
Filling behind abutment	4,000.0
Concrete wall	1,643.0
Dry wall built below	250.0

	Cubic yards.
Abutment—Continued.	
Grading bank	5,397.0
Quarrying stripping, etc	3,703.0
Boating stone	3,703.0
Riprap, hand placed	3,703.0
Sand and gravel unloaded	2,085.0
Lock side:	
Excavation for retaining wall, lower approach to lock	2,150.0
Retaining wall built	200.0
Riprap on slope above dry wall	680.0
Riprap brought from quarry	166.0

Operations closed February 20, 1904, and force proceeded to Lock A on lower Cumberland to resume active work at that point.

Lock No. 4.—The principal work done was completing abutment, building retaining wall to protect lower approach to lock, and grading and riprapping banks of abutment and lower approach to lock. Miscellaneous work consisted in erecting derricks, building tram track, setting machinery, minor repairs of plant, etc. Quantities are as follows:

	Cubic yards.
Abutment:	
Excavation	5,000
Stone quarried	1,173
Stone trammed	1,000
Rubble cut	337
Coping cut	113
Retaining wall, lower end	108
Filling and grading behind	3,283
Riprap bank protection, abutment and lower approach to lock	2,379
Lock side:	
Excavating for retaining wall, lower approach to lock	2,873
Stone quarried for retaining wall	788
Retaining wall built	788

Operations closed March 31, 1904, and force proceeded to Lock No. 1 to resume operations at that point, a statement of which is hereinbefore given.

Snagging.—At the beginning of the fiscal year a snagging party with snag boat *Apex* was engaged in clearing channel of upper Cumberland of surface obstructions, having reached Rowena, Ky., by July 1, 1903. The party proceeded thence downstream as far as Lock No. 3, which was reached September 14, 1903, and snag boat left at that point in charge of overseer. A distance of 249 miles of river was cleared. The details of the work were as follows:

Snags removed	778
Snags cut	776
Leaning trees cut	1,262
Logs cut	366
Trees deadened	22

The U. S. S. *Cumberland* was employed in towing materials, supplies, and floating plant to and from Locks 1, 3, and 4.

The U. S. S. *Henry* towed 74 scows mud and gravel from dredge *No. 1* to dumping place; also towed miscellaneous materials, etc., to and from Lock No. 1.

The U. S. S. *John* moved working force and plant from Lock 4 and Lock 3 to Lock 1 and Lock A, respectively; towed 32 barges mud and gravel from dredge *No. 1* to dumping place, and sundry materials and supplies to and from Lock No. 1.

The balance available June 30, 1904, will be applied to putting Lock No. 1 into operation.

There is a balance of $8,302.18 in the United States Treasury, remaining of the appropriation of the sundry civil act of July 1, 1898, for the "construction of Locks Nos. 5, 6, and 7." This amount remains after completion of masonry of said locks and dam abutments. No appropriation for this section has been made since 1899.

The balance hereinbefore mentioned under Locks Nos. 21 and 22, viz, $16,875.39, remains after having acquired the sites of locks and abutments of Dams Nos. 21 and 22. No appropriation for this section has been made since 1896.

These balances, aggregating $25,177.57, can be used to no practical benefit to the sections to which applicable, as the amounts are too meager to proceed with lock and dam construction, and can not be utilized elsewhere, owing to their restricted application.

It appears that it would be of greater advantage to the work above Nashville, generally, were the amounts in question to be made available where they could be presently utilized. It is believed that this could be done without prejudice to the work to which balances pertain, as operations have been carried forward in localities affected, as far as practicable with funds in hand.

In view of the foregoing, it is respectfully recommended that the unexpended balances now in the United States Treasury of amounts heretofore appropriated by the acts of June 3, 1896, and July 1, 1898, for Locks Nos. 21 and 22 and Locks Nos. 5, 6, and 7, respectively, be made available for "Improving Cumberland River above Nashville, Tenn., General Improvement."

The additional appropriation recommended below should be applied to putting in operation Locks 2, 3, 4, and 5, by construction of dams and erection of gates.

Mr. John S. Walker, assistant engineer, has continued in immediate charge of the details of the work, and the officer in charge desires to note his high appreciation of Mr. Walker's faithful and efficient services.

Money statement.

July 1, 1903, balance unexpended		$243,691.39
Cash deposit, pay due sundry persons uncalled for		2.70
Cash deposit, redemption United States internal-revenue stamps		2.18
		243,696.27
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$87,632.46	
For maintenance of improvement	3,353.92	
		90,986.38
July 1, 1904, balance unexpended		152,709.89
July 1, 1904, outstanding liabilities		27,471.48
July 1, 1904, balance available		125,238.41
July 1, 1904, amount covered by uncompleted contracts		24,024.71
Amount (estimated) required for completion of existing project		6,605,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$495,000.00	
For maintenance of improvement	5,000.00	
		500,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

Improving Cumberland River above Nashville, Tenn., under original projects for open-channel work, from 1876 to 1884.

Geographical division.	Act of—			
	Aug. 14, 1876.	June 18, 1878.	Mar. 3, 1879.	June 14, 1880.
1. Nashville to Kentucky line	$15,000	$20,000	$18,000	$15,000
2. Kentucky line to Smith shoals	10,000	8,000	6,000	10,000
3. Smith shoals	25,000	30,000	15,000	20,000
4. Smith shoals to Falls of Cumberland	2,000	2,000		
Total	52,000	60,000	39,000	45,000

Geographical division.	Act of—			Total.
	Mar. 3, 1881.	Aug. 2, 1882.	July 5, 1884.	
1. Nashville to Kentucky line	$15,000			$83,000
2. Kentucky line to Smith shoals	15,000			49,000
3. Smith shoals	10,000	$15,000		115,000
4. Smith shoals to Falls of Cumberland				4,000
5. Above mouth of Jellico, Kentucky	10,000	5,000		15,000
6. Nashville to Smith shoals		30,000		30,000
7. Nashville to head of Smith shoals			$50,000	50,000
Total	50,000	50,000	50,000	346,000

Improving Cumberland River above Nashville, Tenn., under the present project for a system of locks and dams from Nashville, Tenn., to head of Smith shoals, mouth of Rockcastle River, Kentucky.

Act of—	
August 5, 1886	$75,000.00
August 11, 1888	200,000.00
September 19, 1890	250,000.00
July 13, 1892	250,000.00
August 18, 1894	200,000.00
June 3, 1896	20,000.00
June 4, 1897 (sundry civil act)	350,000.00
July 1, 1898 (sundry civil act)	250,000.00
March 3, 1899	100,000.00
Amended act of June 13, 1902	200,000.00
Total	1,895,000.00
Amount recovered from failing contractor	450.17
Cash deposit taken up, pay due sundry persons uncalled for	2.70
Cash deposit: Redemption of United States internal-revenue stamps	2.18
Aggregate	1,895,455.05

CONTRACTS IN FORCE.

For contracts in force, see report Cumberland River below Nashville

COMMERCIAL STATISTICS.

Cumberland River above Nashville, Tenn., from January 1 to December 31, 1903.

	Tons.		Tons.
Logs	142,420	Salt	1,379
Lumber	17,670	Flour	678
Timber	4,000	Produce	2,971
Poles and posts	9,435	Hay	1,650
Railroad ties	15,170	Grain	4,329
Wood	100	Hogs	20,625
Hoop poles	700	Horses	300
Heading	250	Mules	200
Staves	14,000	Cattle	600
Shingles	55	Sheep	64
Sand	29,112	Fertilizers	3,000
Lime	56	Oil-well supplies	6,000
Cement	300	General merchandise	21,484
Bricks	2,144		
Tobacco	2,370	Total tonnage	304,462
Iron	2,100	Estimated value	$6,604,734
Coal	1,300	Passengers carried	9,552

List of steamboats (stern wheel) plying on the Cumberland River above Nashville, Tenn., and in Kentucky, calendar year 1903.

Name.	Registered dimensions.			Net tonnage.
	Length.	Breadth.	Depth.	
	Feet.	*Feet.*	*Feet.*	
R. Dunbar	160.0	29.4	6.4	158
Bob Dudley	160.0	29.0	3.8	159
Bart E. Linehan	127.0	23.5	3.9	178
Henry Harley	160.0	29.0	3.2	162
A. L. Goldberg	129.0	20.0	3.0	58
T. L. Herbert	117.0	24.0	3.6	80
Victoria	96.3	28.0	10.4	116
Burnside	136.0	21.0	4.6	92
Burkesville	116.5	17.1	3.8	59
Albany	120.0	26.0	4.0	52
Eadsville[a]	44.0	8.0	1.4	2
A. J. Loy[a]	53.0	9.0	1.4	8
Samuel H. Anderson[a]	50.0	8.5	1.4	5

[a] Gasoline.

B B 3.

PRELIMINARY EXAMINATION OF HATCHEE (BIG HATCHIE) RIVER, TENNESSEE, FROM ITS MOUTH TO RIALTO.

[Printed in House Doc. No. 243, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 8, 1903.

Sir: I have the honor to submit herewith a report, dated July 7, 1902, by Lieut. Col. M. B. Adams, Corps of Engineers, on preliminary examination of Hatchee (Big Hatchie) River, Tennessee, from its mouth to Rialto, made in compliance with a requirement in the river and harbor act approved June 13, 1902. The sum of $35,500 has heretofore been expended on this stream under a project for open-river improvement, work having been discontinued in 1895 because of the small commerce to be benefited. Lieutenant-Colonel Adams is of the opinion that the present and prospective commerce of the stream would not justify its radical improvement. The Board of Engineers for Rivers and Harbors, which has examined this report pursuant to the provisions of sections 3 and 14 of the above-mentioned act, states in its report of April 13, 1903, that it is not desirable for the United States to undertake again the improvement of this stream.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF LIEUT. COL. M. B. ADAMS, CORPS OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,
Nashville, Tenn., July 7, 1902.

GENERAL: In compliance with your instructions by letter dated June 23, 1902, and section 14, river and harbor act approved June 13, 1902, I have the honor to forward herewith a report by Asst. Engineer J. S. Walker of a preliminary examination of Big Hatchie River from its mouth to Rialto, in which I concur, and to state as follows:

Inasmuch as there has been considerable effort made to improve this stream without success, and it is estimated that $100,000 more might be applied to improvement with only doubtful results, also since the distance from Rialto to the Mississippi River near Fort Pillow is only about 12 miles, the question of building and equipping a railroad so as to make the water shipping point for Rialto on the Mississippi and not on the Big Hatchie seems worthy of consideration from a business point of view.

Very respectfully, your obedient servant,

M. B. ADAMS,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 12, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., April 13, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has carefully considered the within report of the district officer, the report of the assistant engineer, and such former reports and data as are at hand.

The Big Hatchie River was under improvement from 1880 to 1892 from its mouth to a point far above Rialto; during this time $35,500 was expended in removing snags, trees, and other obstructions. No increase of commerce resulted from this work; on the contrary, commerce decreased from 1890 to 1895, and at present there is little or none.

In the opinion of the Board no appreciable commercial benefit would result from the improvement of this stream. The Board therefore believes that it is not desirable for the United States to undertake again the improvement of "Big Hatchie River, from its mouth to Rialto."

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. J. S. WALKER, ASSISTANT ENGINEER.

ENGINEER OFFICE, UNITED STATES ARMY,
Nashville, Tenn., July 5, 1902.

COLONEL: In compliance with your verbal instructions, I have the honor to submit the following report upon a preliminary examination of Big Hatchie River from its mouth to Rialto, made in pursuance of instructions contained in letter, Office of the Chief of Engineers, United States Army, dated June 23, 1902, and to comply with requirement of item contained in section 14, river and harbor act, approved June 13, 1902.

The official reports and records afford sufficient data for the report. No expense is therefore necessary for the preliminary examination.

Big Hatchie River from its mouth to Rialto lies wholly in the State of Tennessee and empties into the Mississippi River 50 miles above Memphis, Tenn. An examination was made by the United States in 1879 (pp. 1330-1332, Annual Report of Chief of Engineers, 1880). Rialto is about 57 miles from the mouth of the river. The following extract from Annual Report of Chief of Engineers, 1880, page 1905, describes this portion of the river:

"The course of the river is more tortuous than usual in streams of its kind, consisting of a continuous series of loops, the bends almost invariably being narrower at the neck than at the point, and in a direct line the distance from Rialto to the mouth is less than 18 miles, while by river it is 57 miles.

"The banks are subject to overflow for a distance of one-half to 2 miles on each side."

From 1880 to 1892 $35,500 were appropriated for the Big Hatchie (Annual Report of Chief of Engineers, 1895, p. 1952), under a project for removal of snags, logs, leaning timber, etc., from Bolivar, Tenn., to the mouth, a distance estimated at about 240 miles. The original plan contemplated completing work in three low-water seasons at a cost of $30,000. After $35,500 had been expended on this river it was estimated that it would take from $75,000 to $100,000 to remove the obstructions, and that even then there would be little probability of boats being induced to navigate it. The commerce on this stream, almost entirely of timber products, steadily decreased from 1890 to 1895. (See Annual Report of Chief of Engineers, 1895, p. 1955.) The last appropriation for this river was by act of July 13, 1892. In Annual Report of Chief of Engineers, 1895, page 1954, Captain Willard, the district engineer, says:

"I can find no reason for changing the recommendation made in previous reports, viz:

"'The small amount of commerce to be benefited is not at all commensurate to the cost of continuing this improvement or to maintaining what has been done, and for this reason it is not believed that an additional appropriation can be expended profitably unless a greatly increased business be developed,'"

and this river was dropped from the Report of the Chief of Engineers after 1895.

After careful study of the official records and with knowledge of such streams in same section, I am forced to the conclusion that the engineering difficulties in the way of effecting a radical improvement and its maintenance are so great that the limited commerce present and prospective would not warrant such an undertaking; therefore, in my opinion, a survey is not required.

Very respectfully, your obedient servant,

J. S. WALKER,
Assistant Engineer.

Lieut. Col. M. B. ADAMS,
Corps of Engineers.

B B 4.

PRELIMINARY EXAMINATION OF OBION AND FORKED DEER RIVERS, TENNESSEE.

[Printed in House Doc. No. 206, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 1, 1903.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated July 7, 1902, and February 16, 1903, by Lieut. Col. M. B. Adams, Corps of Engineers, on preliminary examination of Obion and Forked Deer rivers, Tennessee, made in pursuance of a requirement in the river and harbor act approved June 13, 1902.

These streams are now under improvement by the General Government with a view to maintaining the channels by removal of obstructions therefrom, and it appears from Lieutenant-Colonel Adams's report that neither the physical character nor the commerce of the streams would justify their radical improvement, experience having shown the existing projects to be most advantageous for these rivers.

The Board of Engineers for Rivers and Harbors, organized under the provisions of section 3 of the act of June 13, 1902, duly considered this report, as required by section 14 of said act, and its report is made in fourth indorsement thereon.

The Board is of the opinion that, while the radical improvement of these streams by means of open-river regulation is not practicable, existing commerce and the influence of the rivers upon freight rates will justify limited expenditures for maintenance by means of snagging operations, etc., and that it is advisable for the United States to continue such work to the extent of expending the sum of $2,250 annually.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen. Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF LIEUT. COL. M. B. ADAMS, CORPS OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,
Nashville, Tenn., July 7, 1902.

GENERAL: In compliance with instructions of June 23, 1902, I have the honor to forward herewith a report made by Asst. Engineer J. S. Walker, by my direction, of a preliminary examination of the Obion and Forked Deer rivers, in compliance with section 14, river and harbor act of June 13, 1902.

In forwarding this report I have the honor to quote from the remarks by Gen. C. B. Comstock, then division engineer, in forwarding a report of Maj. John Biddle (then captain) on this subject, December 24, 1894 (see Annual Report of Chief of Engineers, 1895, p. 2270), as follows:

> The Forked Deer and Obion rivers are so insignificant that I concur with Captain Biddle in the opinion that they can not be made "navigable all the year," as specified in the river and harbor act of August 18, 1894, except by locks and dams. Even with locks and dams the navigability of the lower part of the Obion and its entrances into the Mississippi will depend on the amount of mud and sand which the Mississippi in its floods annually deposits here and which would have to be annually removed. The cost of this maintenance would largely increase the estimated cost of $400,000.

In addition, I would respectfully state, if it is the purpose, as I was informed when inspecting these streams, to place locks and dams on them, that, as a business proposition, it would be cheaper to build and equip a railroad to the Mississippi River and make the place of water shipment where there is no uncertainty about navigation.

With these remarks I concur with Mr. Walker in what he says in his report.

Very respectfully, your obedient servant,

M. B. ADAMS,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

[First indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 12, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 6, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Colonel Adams upon the preliminary examination of Obion and Forked Deer rivers, Tennessee, the report of the assistant engineer, and statements submitted by interested parties.

It appears that Colonel Adams is of the opinion that these rivers are unworthy of improvement beyond the removal of snags and other obstructions provided for under the existing project, but it is not clear to the Board that he recommends the continuance of the improvement. The Board recommends that Colonel Adams be requested to give this information, and to state if, in his opinion, the present project provides sufficient funds for its proper execution.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

[Third indorsement.]

Office Chief of Engineers, U. S. Army,
February 24, 1903.

Respectfully returned to the Board of Engineers for Rivers and Harbors, with further report by Lieut. Col. M. B. Adams, as recommended in the preceding indorsement.

By command of Brig. Gen. Gillespie:

A. Mackenzie,
Colonel, Corps of Engineers.

[Fourth indorsement.]

Board of Engineers for Rivers and Harbors,
Washington, D. C., April 15, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has given due consideration to the reports of the district officer and the assistant engineer, and to other data at hand.

The character of the Obion and Forked Deer rivers, Tennessee, is such that a radical improvement by means of open-river regulation is impossible. The great expense of a slack-water improvement would be unjustifiable in view of the limited commerce of the streams.

It is the opinion of the Board, however, that existing commerce and the influence of the rivers upon freight rates will justify limited expenditures in the future as in the past for maintenance by means of snagging operations, etc. In recent river and harbor acts items of $4,500 have appeared for the maintenance of these streams, and the Board is of opinion that it is advisable for the United States to continue work upon the Obion and Forked Deer rivers, Tennessee, to the extent of expending upon the same for maintenance the sum of $2,250 annually.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

REPORT OF MR. J. S. WALKER, ASSISTANT ENGINEER.

Engineer Office, United States Army,
Nashville, Tenn., July 5, 1902.

Colonel: In compliance with your verbal instructions I have the honor to submit the following report upon a preliminary examination of Obion and Forked Deer rivers, made in pursuance to instructions contained in letter Office of the Chief of Engineers, United States Army, dated June 23, 1902, and to comply with requirement of item contained in section 14, river and harbor act approved June 13, 1902.

The official reports and records afford sufficient data for this report; no expense is therefore required for preliminary examination.

Obion River lies wholly in the State of Tennessee, and empties into the Mississippi River about 5 miles below the Missouri and Arkansas State line. A preliminary examination and instrumental survey was made of this stream and reported in the Annual Report of Chief of Engineers, 1891, page 2292 et seq. The original project based on this survey had for its object to secure and maintain a navigable low-water channel of not less than 3 feet, at an estimated cost of $50,000. The operations prior to 1896 demonstrated the impracticability of doing this, and all that could be done would be to keep the channel free from snags and trees. The river flows through a low alluvial country subject to overflow, due in a great measure to back water from the Mississippi River, and logs and drift accumulate every year to so great an extent that it is believed that such accumulation would almost render inoperative any system of slack-water navigation even did the commerce justify the expense of making such radical improvement. The commercial statistics obtainable indicate that the commerce is almost wholly composed of timber products.

Forked Deer River lies wholly in the State of Tennessee and empties into the Obion River about 3½ miles from its mouth. It has been examined and surveyed at various times as appears below:

1. *Of the North Fork and Forked Deer River.*—From Dyersburg to mouth of main stream, distance about 29½ miles, made in 1873 under act of March 3, 1873. (Report Chief of Engineers, 1874, Part 1, pp. 372–380.)
2. *Of the South Fork.*—From Jackson to junction with North Fork, distance about 149 miles; of the North Fork, from Collins to the mouth of Forked Deer River, main stream, distance about 131 miles, each made in 1880 under act of June 14, 1880. (Report Chief of Engineers, 1881, pp. 1489–1497.)
3. *Of the North Fork below Dyersburg, Tenn.*—Preliminary examination made in 1886 under act of August 5, 1886. (Report Chief of Engineers, 1887, pp. 1494–1495.)
4. *Of the Forked Deer River.*—From Dyersburg, Tenn., to its junction with the Obion River, and thence to the Mississippi River, made in October, 1894, act of August 18, 1894. (Report Chief of Engineers, 1895, pp. 2265–2275.)
5. *Survey of the North Fork of Forked Deer River, Tennessee.*—From Dyersburg to the main stream, thence to Obion River, made in November, 1896, under act of June 3, 1896. (House Doc. No. 282, 54th Cong., 2d sess.)

These reports show that the best thing to do in the way of improvement is to keep the river free from obstructions. The narrowness of the river and the fall preclude improvement by open-channel work. An estimate was made for locks and dams, but neither the district officer nor division engineer recommended such an undertaking. (See Annual Report of Chief of Engineers for 1895, pp. 2266 et seq.) Experience had with this river since that date confirms and strengthens the opinion then expressed against any attempt at radical improvement. The benefits derived from this improvement are indefinite. The commerce consists almost entirely of timber products.

The surveys now of record afford all the data necessary for the execution of the existing projects, which, as experience shows, are most advantageous for these rivers. Therefore, in my opinion, there exists no necessity for any additional surveys of the Obion and Forked Deer rivers.

Very respectfully, your obedient servant,

J. S. Walker,
Assistant Engineer.

Lieut. Col. M. B. Adams,
Corps of Engineers.

SUPPLEMENTARY REPORT ON PRELIMINARY EXAMINATION.

Engineer Office, United States Army,
Nashville, Tenn., February 16, 1903.

General: I have the honor to state in reply to your letter of the 12th instant that the commercial statistics supplied on the Obion and Forked Deer rivers show that there were 26,717 tons, valued at $71,521, and 1,100 passengers moved on these streams during the year January 1 to December 31, 1901.

My opinion is that the appropriations provided for maintenance on these streams, $4,500 annually or biennially, will aid very much in keeping them in a navigable condition when the backwater from the Mississippi River produces sufficient depths for boats to run up to Dyersburg or Obion.

If $4,500 is appropriated once in two years, the annual expenditure would be about 3 per cent on value of the shipments and 8 cents per ton on the tonnage of 1901.

Inasmuch, therefore, as these streams have been undergoing improvement in some form for twenty years, a discontinuance of Government aid now might be an unwarrantable step; consequently, it is respectfully recommended that the improvement be continued by maintenance to the extent as hereinbefore indicated.

Very respectfully, your obedient servant,

M. B. ADAMS,
Lieut. Col., Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.

APPENDIX C C.

IMPROVEMENT OF TENNESSEE RIVER AND ITS TRIBUTARIES.

REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1904, WITH OTHER DOCUMENTS RELATING TO THE WORKS. OFFICERS IN CHARGE, CAPT. W. J. BARDEN AND MAJ. H. C. NEWCOMER, CORPS OF ENGINEERS.

IMPROVEMENTS.

1. Tennessee River.
2. Operating and care of Muscle Shoals Canal, Tennessee River.
3. French Broad and Little Pigeon rivers, Tennessee.
4. Clinch, Hiwassee, and Holston rivers, Tennessee and Virginia.

EXAMINATIONS.

5. Elk River, Tennessee.
6. Hiwassee River, Tennessee.

Engineer Office, United States Army,
Chattanooga, Tenn., July 9, 1904.

General: I have the honor to transmit herewith the annual report for the works of river and harbor improvement in my charge for the fiscal year ending June 30, 1904.

Capt. W. J. Barden, Corps of Engineers, was in charge of this district until May 31, 1904, when it was transferred to me.

Very respectfully, your obedient servant,

H. C. Newcomer,
Major, Corps of Engineers.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U. S. A.

C C 1.

IMPROVEMENT OF TENNESSEE RIVER.

The Tennessee River is 652 miles long. It is formed by the junction of the French Broad and Holston rivers, 4.5 miles above Knoxville and 188 miles above Chattanooga, and flows into the Ohio at Paducah, 464 miles below Chattanooga.

A general description of the Tennessee River system of navigation is given in the Annual Report of the Chief of Engineers for 1897, page 2247. More detailed accounts of portions of the river are given as follows:

Part above Chattanooga (*188 miles*).—Map, Annual Report for 1876, page 710; report of survey, Annual Report for 1893, page 2333.

From Chattanooga to Scott Point (*17.5 miles*).—Report of survey, Annual Report for 1900, page 2956.

From Scott Point to head of Muscle Shoals Canal (*158 miles*).—Report of survey, Annual Report for 1902, page 1743.

From head of Muscle Shoals Canal to Florence (*32.1 miles*).—Maps, Annual Report for 1882, page 1840.

From head of Colbert and Bee Tree shoals to Riverton (*9 miles*).—Map, Annual Report for 1898, page 1900.

From Riverton to mouth (*226 miles*).—Annual Report for 1897, page 2262.

The river is navigable the entire year from the mouth to Riverton, Ala. Just above Riverton a lateral canal about 8 miles long is now under construction past the Bee Tree and Colbert shoals. A canal 3 miles long is projected at Little Muscle shoals just above Florence, Ala., and the Muscle Shoals Canal now surmounts the Big Muscle shoals and Elk River shoals.

By act of April 26, 1904, Congress authorized the construction by local interests of a lock and dam at Scott Point, designed to form a pool extending 17.5 miles upstream to Chattanooga.

Local boat lines have headquarters at the principal towns along the river. There is no through traffic covering the entire length of the river, the longest regular boat service being found between Chattanooga and Paducah when the stage of water permits.

From commercial statistics, given later in detail, it will be seen that the total tonnage of freight moved on the Tennessee River during the calendar year 1903 was 1,683,723 tons. Of this 208,352 tons were rafted.

The movement of the balance may be thus summarized:

Distance on Tennessee River between terminal points of carriers' routes.	Freight moved.
	Tons.
Over 450 miles	8,404
200 to 260 miles	650,438
100 to 200 miles	106,069
50 to 100 miles	227,362
10 to 50 miles	276,349
4 to 10 miles	128,382
Under 4 miles	78,367
Total	1,475,371

The amount so far appropriated and allotted for the Tennessee River and the canals thereon, including the amount for operating canals, is $6,752,510.34; of this sum $851,497.82 has been allotted for operating and care and repair of the Muscle Shoals Canal from November, 1890, when it was opened to navigation, to June 30, 1904.

For purposes of appropriations the river has been divided into the following different sections, where are given additional details.

1. ABOVE CHATTANOOGA (188 MILES).

The plan of improvement, based on the survey of 1891, is to obtain a 3-foot low-water channel, at a cost of $650,000 additional to prior expenditures. It received Congressional approval August 18, 1894. Work under this plan consists of removing obstructions and the construction of wing dams and training walls.

Improvements were carried on during the fiscal year at Bracketts bar, Kings bar, mouth of Richland Creek, and Knoxville, and on the river between Kingston and Chattanooga.

Bracketts bar (88.6 miles above Chattanooga).—The channel through this bar, begun the previous year, was completed to dimensions of 130 feet in width and 2,100 feet in length, with a minimum depth of 3 feet at low water. Four cuts were made. From three of these cuts there were removed 21,775 cubic yards of sand and gravel and 925 cubic yards of rock. The material from the last cut made was cast up so as to mark the right side of the channel; the left side was marked by the placing of 8 buoys.

Kings bar (90 miles above Chattanooga).—The work at this place consisted in building two wing dams to confine the channel to the right bank. A quarry was opened, 3,834 cubic yards of earth stripped, and 4,659 cubic yards of rock quarried and used inconstruction; making the dams 500 feet and 950 feet long, respectively.

Richland Creek (40 miles above Chattanooga).—The river and harbor act of June 13, 1902, appropriating $50,000 for improving Tennessee River above Chattanooga, provided for the expenditure of such an amount at Richland Creek as might be necessary "to facilitate navigation and the landing of boats at that point."

An examination was made, and a dredge, barges, and necessary plant were sent to this place in November, 1903. About 1,645 cubic yards of mud and gravel were dredged from a bar in the creek near its mouth; two sunken barges, loaded with iron ore, and part of a third barge were removed; part of a rock reef was blasted away and 3 trees were cut.

Knoxville, Tenn.—A small riprap dam was built across a slough just below the county bridge, connecting the left bank of the river with the retaining wall which joins Flennikens Island with Luttrells Island; 600 cubic yards of riprap were used in the work.

Between Kingston and Chattanooga.—The river between Kingston and Chattanooga was cleared of obstructions as follows: Snags pulled, 199; sunken barges broken and raised, 3; stone blasted and removed, 37 cubic yards; trees cut, 154. At Chattanooga 8 cubic yards of drift and débris which had accumulated around the pier gauge were cleared away and part of an old bridge pier removed, and at the mouth of Chickamauga Creek 6 snags were pulled.

At the close of the working season the fleet was taken to Knoxville to be cared for.

It is proposed to apply the available balance to the care of plant and the additional appropriation of $50,000 recommended to maintenance and continuing work under the approved project, selecting first those obstructions that may be found to offer the greatest hindrance to navigation.

Money statement.

July 1, 1903, balance unexpended		$19,440.59
Proceeds of sales		1.77
		19,442.36
June 30, 1904, amount expended during fiscal year, for works of improvement		17,383.86
July 1, 1904, balance unexpended		2,058.50
July 1, 1904, outstanding liabilities		268.53
July 1, 1904, balance available		1,789.97
Amount (estimated) required for completion of existing project		505,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$45,000.00	
For maintenance of improvement	5,000.00	
		50,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

Act of—	
April 10, 1869	$35,000.00
March 3, 1871, transferred from below Chattanooga	35,000.00
June 10, 1872	25,000.00
March 3, 1873	25,000.00
June 23, 1874	25,000.00
March 3, 1875	40,000.00
August 14, 1876	15,000.00
June 18, 1878	15,000.00
March 3, 1879	11,500.00
June 14, 1880	10,000.00
March 3, 1881	7,000.00
August 2, 1882	7,000.00
July 5, 1884	3,000.00
August 5, 1886	$7,500.00
August 11, 1888	15,000.00
September 19, 1890	30,000.00
July 13, 1892	25,000.00
August 18, 1894	50,000.00
June 3, 1896	15,000.00
March 3, 1899	30,000.00
June 13, 1902	50,000.00
	476,000.00
Proceeds of sales of condemned property (July, 1903)	1.77
Total	476,001.77

2. CHATTANOOGA, TENN., TO RIVERTON, ALA. (238 MILES).

Obstructions to the low-water navigation of this section are to be found in the mountain region between Chattanooga and Scott Point, where Congress has authorized the construction of a lock and dam by local interests; at sundry shoal places thence down to the Muscle Shoals Canal; between the upper and lower sections of the canal; at Little Muscle shoals, between the canal and Florence, where a 3-mile lateral canal is projected; between Florence and the Colbert Shoals Canal, now in progress of construction, and at the two shoals to be avoided at low water by this canal.

OPEN RIVER WORK.

The plan of improvement for the open river work is to obtain a 3-foot low-water channel by dredging and construction of wing dams and training walls. In 1901 (report of 1902, p. 1743) a revised plan, with report of survey, was submitted, providing for an open channel depth of 5 feet at normal low water between the mountain section and the Muscle Shoals Canal at an estimated cost of $770,640; but this has not yet been approved by Congress.

No work of this character has been done this fiscal year by the Government, the only funds available being the balance of $2,946.03 remaining from the allotment of $6,000 made from the emergency river and harbor act of June 6, 1900, for dredging at Sweetwater bar, about 1 mile above Florence. The tolerably fair condition of the channel at this point, resulting from the previous season's work, and the necessity for considerable repairs to dredging plant before resuming operations, rendered it inexpedient to do any work this season. It is proposed to further improve the channel, during the coming season, with the remainder of this allotment, together with the additional allotment of $3,600 made June 7, 1904, for this point, from the emergency appropriation of $200,000 provided by the river and harbor act of June 13, 1902.

The Nashville, Chattanooga and St. Louis Railway Company maintains a freight and passenger boat transfer service between Guntersville and Hobbs Island, a distance of 22 miles. During the year 1903 there were transferred by these boats 53,527 tons of freight and 8,969 passengers. Shoaling occurs on this section of the river, and the amount of traffic involved is sufficient to warrant Government aid in facilitating it.

By the authority of the Secretary of War the Nashville, Chattanooga and St. Louis Railway Company was permitted to do some dredging in the slough channel leading from the river to its incline at Guntersville, under the supervision of the engineer officer in charge of the district. About 3,270 cubic yards of soft material were dredged, by which a channel was made 600 feet long, 75 feet wide, and 3 feet deep at low water. Although the improvement was required primarily for the railroad traffic, it also benefited all boats wishing to touch at Guntersville, which is the most important steamboat landing between Bridgeport and Decatur, Ala.

It is proposed to apply the additional appropriation of $35,000 recommended for open river work on this section of the river principally to improving the channel at Bridgeport Island; at several shoal places between Guntersville and Hobbs Island; at Willards and Gilchrist chutes, above and below the Elk River division of the Muscle Shoals Canal, where overhanging trees menace passing boats; and at Little Muscle shoals, where a number of the wing dams and training walls are in need of repairs.

CANAL WORK.

(*a*) *Chattanooga to Scott Point* (*17.5 miles*).—The city of Chattanooga has not yet given notice of any intention on its part to build the lock and dam at Scott Point authorized by act of April 26, 1904. Should the city decline to do this within four months from the passage of the act, as now appears probable, the privilege of undertaking the work will be vested in C. E. James and J. C. Guild, residents of Chattanooga, their heirs and assigns, for a further period of eight months. An allotment of $6,000 was made June 23, 1904, from the appropriation for examinations, surveys, and contingencies of rivers and harbors, act of June 13, 1902, to cover the cost of preparing the plans, specifications, and drawings, as the act provides that this is to be done at the expense of the United States.

(*b*) *Muscle Shoals Canal* (*18 miles*).—This work, completed in 1890, has since then been operated and maintained under the indefinite appropriation of July 5, 1884, for "Operating and care" of canals and other works of navigation, and an account of the year's operations is given further on under this head.

(*c*) *Little Muscle Shoals Canal* (*3 miles*).—No work has ever been done under this project, adopted in 1890, as no appropriation has yet been made for it.

(*d*) *Colbert Shoals Canal* (*8 miles*).—The masonry work of the lift lock and its approaches at the lower end of this canal, at Riverton, was begun in 1893 and completed in 1900. Under the act of June 13, 1902, authorizing additional contracts for this work to the amount of $600,000, a contract was made in May, 1903, with the Sheridan-Kirk Contract Company for building the upper section of the canal. A contract supplemental to this was entered into December 14, 1903, with the object of securing the construction of about 1,500 additional linear feet of the concrete river wall—thus extending it to the site of the proposed guard lock—by the substitution of a rock-fill dam with rubble masonry toe wall for about 5,500 feet of the upper end of the wall. The length of concrete wall to be omitted will be determined by the amount of rock to be excavated from the canal prism; this amount to be sufficient to form a dump with the outer top end not less than 40 feet from the inside line of wall, or toe, and with top at reference 42—the normal low-water surface of the canal being at reference 33.5. A toe wall of rubble masonry not less than 2 feet thick is to be built along the line of the omitted concrete wall, having its top at elevation 34. The rock-fill dam is to rise from this toe wall with a slope not steeper than 1 on 1¼. The longitudinal cofferdam is to be left in place, covered by the rock fill.

To compensate the contractors for additional expense in making the rock fill with toe wall, and for loss of profits on account of reduction of about 6,000 cubic yards in the amount of concrete to be placed in the river wall, they will be allowed to substitute crusher dust for sand in all concrete and mortar, and the price for excavating the rock used in the rock-fill dam is increased from $1.98 to $2.33 per cubic yard. The contractors will also receive $2.50 per linear foot for the additional cofferdam required for a portion of the rock-fill dam.

The contractors arrived on the work in June, 1903, and actual excavation was begun in August, 1903. At the end of the fiscal year the following work had been done:

Earth excavated	cubic yards	27, 313
Rock excavated	do	21, 908
Cofferdam completed	linear feet	2, 900

No work was done during the months of February, March, and April of the current year, as the cofferdams were liable to be flooded by the usual winter and spring rises in the river.

The estimated cost of completing the canal, including the current contract, is $2,200,000. Appropriations aggregating $550,000 have been made to this end. To complete the canal an additional appropriation of $1,650,000 is therefore necessary. As contracts amounting to $50,000 of this sum are now authorized, it is urged that authority be given to enter into further contracts amounting to

$1,600,000, the work to be paid for as appropriations may, from time to time, be made by law; also that one-third of the amount needed to complete this canal be appropriated during each of the next three sessions of Congress.

Only the lack of funds prevents work being carried on in the lower section of the canal and on the machinery and gates of both locks simultaneously with the construction of the upper section.

In February, 1904, a tract of 1.42 acres of land adjoining the United States reservation at the lift lock was acquired by the United States. This small tract was necessary to avoid possible future claims, as it had been partially occupied by the United States.

Money statement.

July 1, 1903, balance unexpended		$552,375.26
Amount allotted from appropriation for maintenance of river and harbor improvement, act of June 13, 1902		3,600.00
Proceeds sales of condemned property		34.91
		556,010.17
June 30, 1904, amount expended during fiscal year, for works of improvement		54,221.60
July 1, 1904, balance unexpended		501,788.57
July 1, 1904, outstanding liabilities		26,470.72
July 1, 1904, balance available		475,317.85
July 1, 1904, amount covered by uncompleted contracts		443,160.86
Amount (estimated) required for completion of existing project		5,165,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$575,000.00	
For maintenance of improvement	10,000.00	
		585,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS AND ALLOTMENTS.

March 2, 1827 (survey)	$200.00
June 9, 1860 (claim)	1,350.00
July 25, 1868	85,000.00
April 10, 1869	5,095.00
July 11, 1870	45,000.00
June 10, 1872	50,000.00
March 3, 1873	100,000.00
June 23, 1874	100,000.00
March 3, 1875	360,000.00
August 14, 1876	255,000.00
June 18, 1878	300,000.00
March 3, 1879	210,000.00
June 14, 1880	300,000.00
March 3, 1881	250,000.00
August 2, 1882	250,000.00
July 5, 1884	350,000.00
August 5, 1886	262,500.00
August 11, 1888	250,000.00
September 19, 1890	450,000.00
July 13, 1892	475,000.00
August 18, 1894	$275,000.00
June 3, 1896	50,000.00
March 3, 1899	135,000.00
June 13, 1902	200,000.00
March 3, 1903 (sundry civil act)	350,000.00
March 23, 1903 (emergency river and harbor act of June 6, 1900)	6,000.00
June 7, 1904 (emergency appropriation, act of June 13, 1902)	3,600.00
	5,118,745.00
Received on account of transfer settlement	3.91
July, 1903, proceeds of sales of condemned property	34.91
Total	5,118,783.82

ABSTRACT OF CONTRACT WITH SHERIDAN-KIRK CONTRACT COMPANY, OF CHARLESTON, W. VA., FOR BUILDING SECTION OF COLBERT SHOALS CANAL.

Contract dated May 5, 1903, approved May 16, 1903. Supplemental contract dated December 14, 1903; approved February 4, 1904.

Date of beginning work, June 20, 1903; date of expiration, September 20, 1905.

Concrete, $8.28 per cubic yard; earth excavation, 50 cents per cubic yard; rock excavation, $1.98 and $2.33 per cubic yard; iron and steel, 7 cents per pound; laying masonry, $6 per cubic yard; riprap, $2 per cubic yard; stone backing, $10 per cubic yard; stone coping, $24 per cubic yard; face stone, $16 per cubic yard; special stone, $24 per cubic yard; timber, $50 per 1,000 feet B. M.; test holes, 60 cents per linear foot; additional cofferdam required for a portion of the rock-fill dam under supplemental contract, $2.50 per linear foot.

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3. BELOW RIVERTON, ALA. (226 MILES).

The plan of improvement for this section of the river is to obtain, by dredging, a low-water channel not less than 5 feet deep and 150 feet wide.

Big Bend shoals (202 miles above Paducah).—The U. S. dredge *Kentucky*, which had been working at Rockport bar, was transferred to Big Bend shoals, where it arrived June 30, 1903.

These shoals, which are nearly 3 miles long, begin about 21 miles below Riverton, and consist of a succession of rock ledges and reefs situated so as to render the channel tortuous and shallow; the fall is almost 2 feet to the mile, and the greatest depth at low water is about 26 inches. Hamburg, Tenn., at the foot of these shoals, is considered the head of low-water navigation for the larger boats plying on the lower river.

After removing about 300 cubic yards of rock at this place it was found that the hard blue limestone ledges could not be managed by the dredge, and that blasting would have to be resorted to. The water was too high for such work, and the dredging plant was transferred to Beech Creek Island, about 50 miles farther downstream.

Beech Creek Island (153 miles above Paducah).—The channel dredged at this place in 1900 had shoaled so as to impede navigation, and requests were received from steamboat men that early work be done here.

Dredging began on the 21st of July and was continued until October 20, when the funds were practically exhausted. The work was limited to two places: One, the upper bar, from which 42,100 cubic yards of sand and gravel were dredged; the other, the channel between a detached bar and Beech Creek Island, from which 67,600 cubic yards of similar material were dredged.

The cost of the above field work was $5,028.63, a little more than 4½ cents per cubic yard. The dredge was in commission one hundred and twelve days, during which time it worked sixty-six days, having lost eighteen days on account of Sundays and holidays, fourteen days in traveling, and fourteen days on account of accidents. The average amount of loose material excavated per working day was 1,769 cubic yards.

Further details of the work on this section of the river are given in the appended report of J. E. Hall, surveyor.

Under date of June 7, 1904, an allotment of $6,200 was made from the emergency appropriation in the river and harbor act of June 13, 1902, for maintenance of channels at Rockport bar and Beech Creek Island bar. It is proposed to apply the available funds at these two points during the coming season.

It is proposed to apply the additional appropriation of $40,000 recommended to maintenance and continuing work under the approved project, selecting first those obstructions that are found to offer the greatest hindrance to navigation.

Money statement.

July 1, 1903, balance unexpended		$7,918.46
Settlement of damage to United States dredge		26.93
Amount allotted from appropriation for emergencies in river and harbor works, act of June 13, 1902		6,200.00
		14,145.39
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$5,700.43	
For maintenance of improvement	2,061.25	
		7,761.68
July 1, 1904, balance unexpended		6,383.71
July 1, 1904, outstanding liabilities		8.65
July 1, 1904, balance available		6,375.06
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$35,000	
For maintenance of improvement	5,000	
		40,000
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS AND ALLOTMENTS.

For Tennessee River below Riverton, Ala.

September 19, 1890	$25,000.00
July 13, 1892	25,000.00
August 18, 1894	125,000.00
March 3, 1899	100,000.00
June 13, 1902	19,000.00
June 7, 1904 (emergency appropriation, act of June 13, 1902)	6,200.00
	300,200.00
October, 1903, paid by Ayer & Lord Tie Company for damage to United States dredge	26.93
Total	300,226.93

COMMERCIAL STATISTICS.

Tennessee River above Chattanooga, Tenn.

Articles.	Year ending December 31, 1903.	
	Tons.	Estimated value.
Brick	397	$1,734
Coal	5,415	12,183
Cotton	50	12,000
Cotton seed	25	532
Fertilizer	1,133	22,660
Flour	160	7,200
General merchandise	10,141	1,210,865
Grain	15,236	338,489
Hay	2,933	58,676
Iron, scrap	11	82
Iron ore	205,000	328,000
Live stock	2,123	339,680
Logs	122,148	977,188
Lumber	27,298	341,227
Marble	22,060	441,200
Produce	2,639	209,047
Railroad ties	2,625	7,350
Sand	115,135	76,757
Shingles	55	1,489
Shucks	77	770
Stone	1,370	1,370
Straw	630	3,783
Tan bark	260	3,600
Telegraph poles	12,000	84,000
Wood	3,347	3,347
Total	552,268	4,483,229

Floated down in rafts (logs, poles, and wood), 144,264 tons; number of passengers transported (1903), 4,939.

Details of the traffic for 1903 are shown in the following table:

Between what points.	Miles on Tennessee River.	Passengers.	Tons.
Moved in rafts (logs, poles, and lumber):			
Kingsport, Tenn., to Chattanooga	188.0		2,000
Clinton, Tenn., to South Pittsburg	149.5		6,000
Little Tennessee River to Chattanooga	127.3		1,000
Loudon, Tenn., to Chattanooga	127.3		6,379
Speers Ferry, Va., to Chattanooga	103.5		46,100
Dungannon, Va., to Chattanooga			3,000
Clinton, Tenn., to Chattanooga			12,000
Kingston, Tenn., to Chattanooga			5,000
Headwaters Powells River to Chattanooga			299
Jonesville, Va., to Chattanooga			20,600
Mouth of Emory River to Chattanooga			3,000
Charleston, Tenn., to Chattanooga	35.5		3,866
Mouth of Ocoee River to Chattanooga	35.5		2,400
Little Tennessee River to Loudon	10.0		1.032
Paint Rock, Tenn., to Kingston	8.2		1,000
North Fork Holston River to Knoxville	4.5		2,501
Surgoinsville, Tenn., to Knoxville			800
Kingsport to Knoxville			8,000
Newport, Tenn., to Knoxville			7,300
Hickory Ridge, Tenn., to Knoxville			1,020
Sevierville, Tenn., to Knoxville			98
Catlettsburg, Tenn., to Knoxville			2,000
Hendersons Landing, Tenn., to Knoxville			2,000
May Springs, Tenn., to Knoxville			200
Dandridge, Tenn., to Knoxville			220
Speers Ferry, Va., to Knoxville			4,000
Moved by steamboats:			
Harriman, Tenn., and Chattanooga	103.5		685
Kingston and Chattanooga	103.5	2,758	23,568
Kingston and Leadvale, Tenn	84.5	806	25,765
Kingston and Knoxville	80.0		233
Clinton and Dayton Landing, Tenn	63.0	50	850
Harriman and Dayton Landing	63.0		175
From sand bar in river to Chattanooga	45.0		43,111
Crescent mines and mouth of Richland Creek	40.0		75,000
Mouth of Ocoee River and Chattanooga	35.5	975	7.586
Round Island mines and Rockwood Landing	19.0		56,800
Marble quarries on French Broad River to 10 miles below Knoxville	14.5	350	17,250

Between what points.	Miles on Tennessee River.	Passengers.	Tons.
Moved by steamboats—Continued.			
Marble quarries on French Broad River to 1 mile below Knoxville	5.5	....	46,000
Catlettsburg, Tenn., and Knoxville	4.5	....	200
Kingsport and Knoxville	4.5	....	173
Ironton ore docks and Rockwood Landing	4.0	....	80,375
Moved by flatboats and barges:			
From sand bar in river to Chattanooga	18.0	....	15,000
Little Tennessee River to Lenoir City	10.0	....	3,572
Dandridge, Tenn., to Knoxville	4.5	....	223
Kingsport, Tenn., to Knoxville	4.5	....	43
Marble quarries on French Broad River to Knoxville	4.5	....	1,370
From island above Maryville bridge to loading derrick at Knoxville	.6	....	12,474
Total		4,939	552,268

Of the 11 steamboats reported in the last annual report as plying on the Tennessee River above Chattanooga, the *City of Loudon* and the *Isabella King* were not in this service during the year; but the number of barges was increased from 66 to 86.

One new boat was put on, of the dimensions, etc., given below:

Name.	Length.	Width.	Depth.	Net tonnage.	Height of pilot house.	Height of smokestack.	Number of barges.	Capacity of barges.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*		*Tons.*
Jane Austin	112	18	3.4	86	22	26	3	135

The total number of craft operating in this section of the river during the calendar year 1903 was 10 steamboats, of a total of 714 tons burden, net, and 86 barges, of a total capacity of 7,410 tons, as shown on list below.

Seven steamboats, the *Bill Tate*, *Clinch*, *Flora Swann*, *Gasconade*, *Jane Austin*, *N. B. Forrest*, and *W. T. Gallaher*, a total tonnage of 472; and 49 barges, total capacity, 3,350 tons, are also reported as plying on the Clinch River. The *Bill Tate*, *Clinch*, *Flora Swann*, *Jane Austin*, and *Oliver King*, total tonnage, 279; and 47 barges, total capacity, 1,965 tons, are also reported as plying on the French Broad River. The *Bill Tate* and 1 barge are also reported on the Holston River.

List of boats and barges navigating the Tennessee River above Chattanooga, Tenn., during the year 1903.

Name.	Net tonnage.	Barges.		Between what points.	Miles on Tennessee River.
		Number.	Tonnage.		
N. B. Forrest	134	9	1,200	Kingston and Chattanooga	103.5
Gasconade	74				
W. T. Gallaher	27	3	180	Harriman and Chattanooga	103.5
		3	900	Ironton ore dock and Rockwood Landing.	4.0
Bill Tate	70	25	1,050	Kingston and Leadvale	84.5
Flora Swann	57				
Jane Austin	86				
Clinch	24	2	80	Kingston and Knoxville	80.0
		4	320	Clinton and Dayton Landing	63.0
		1	90	Harriman and Dayton Landing	63.0
		5	200	Marble quarries on French Broad River and 1 mile below Knoxville	5.5
		2	80	Catlettsburg and Knoxville	4.5
Sam A. Connor	63	2	100	Mouth of Ocoee River and Chattanooga.	35.5
Grady	137	4	1,200	Round Island mines and Rockwood Landing.	19.0
		4	1,200	Ironton ore dock and Rockwood Landing.	4.0
Oliver King	42	12	540	Marble quarries on French Broad River and 10 miles below Knoxville.	14.5
		3	175	Sand bar in river and Chattanooga	18.0
		3	50	Little Tennessee River and Lenoir City.	10.0
		1	10	Marble quarries and Knoxville	4.5
		1	15	Dandridge and Knoxville	4.5
		2	20	Maryville bridge and loading derrick, Knoxville.	.6
Total	714	86	7,410		

Comparative statement of commerce for the past ten years.

Year.	Tons.	Estimated value.
1894	160,818	....
1895	265,256	$4,527,589.20
1896	623,915	2,788,022.20
1897	256,331	2,693,802.85
1898	218,378	2,425,066.60
1899	269,552	2,839,037.55
1900	380,697	3,847,629.30
1901	294,607	2,604,931.00
1902	478,268	4,296,822.00
1903	552,268	4,483,229.00

Tennessee River, between Chattanooga, Tenn., and Florence, Ala.

Articles.	Year ending December 31, 1903.	
	Tons.	Estimated value.
Brick	279	$1,218
Cement	3,372	42,150
Coal	1,046	2,353
Cotton	7,596	1,823,040
Cotton seed	2,392	119,588
Fertilizer	2,730	54,600
Flour	7,406	33,327
General merchandise	30,353	3,765,085
Grain	5,967	158,003
Hay	1,397	27,934
Iron, pig	1,204	33,712
Live stock	1,289	154,680
Logs	44,186	353,488
Lumber	21,526	269,075
Machinery	595	178,500
Peanuts	50	6,500
Produce	1,376	147,247
Railroad ties	2,200	6,160
Sand	3,834	2,556
Spokes	2,675	32,100
Staves	225	2,700
Stone	2,850	14,250
Straw, etc	154	1,104
Tan bark	1,895	26,244
Tobacco	4	2,800
Wood	151,250	181,500
Total	297,851	7,439,914

Number of passengers transported (1903), 17,134.

Of the traffic for 1903, 37,354 tons were moved by raft; 8,969 passengers and 53,527 tons of freight by railroad transfer boats between Hobbs Island and Guntersville, Ala., a distance of 22 miles. Of the remaining 206,970 tons, 8,404 were carried by the through boats plying between Chattanooga, Tenn., and Paducah, Ky.

Details of the traffic for 1903 are shown in the following table:

Between what points.	Miles on Tennessee River.	Passengers.	Tons.
Moved in rafts (logs and lumber):			
Clinton, Tenn., to South Pittsburg, Tenn	149.0	....	6,000
Shellmound, Tenn., to Browns Ferry, Ala	131.0	....	10,000
Bridgeport, Ala., to Decatur, Ala	110.0	....	600
McGuinn, Ala., to Decatur	83.0	....	15,200
Towncreek, Ala., to Decatur	56.0	....	109
Shellmound to Pine Island, Alabama	54.0	....	153
Guntersville, Ala., to Decatur	53.5	....	3,666
Chattanooga to Bridgeport	50.0	....	300
Paint Rock River, Alabama, to Decatur	38.5	....	920
Cannon Landing, Elk River, to Florence	28.5	....	150
Towncreek to Hobbs Island, Alabama	24.0	....	156
Lock B to Lock 1, Muscle Shoals Canal	8.0	....	100

Between what points.	Miles on Tennessee River.	Passengers.	Tons.
Moved by steamboats and barges:			
Chattanooga, Tenn., and Paducah, Ky	464.0	600	8,404
Chattanooga and Florence	208.0	2,872	40,115
Chattanooga and Decatur	160.0	3,843	33,370
Bridgeport and Lock 1	137.0	....	1,249
Decatur, Ala., and Savannah, Tenn	115.5	600	750
Elk River and Larkins Landing, Ala	93.0	....	1,702
Shellmound and Pine Island	54.0	....	1,910
Decatur and Guntersville, Ala	53.5	....	117,325
Decatur and Lambs Ferry, Ala	23.5	250	2,145
Hobbs Island and Guntersville	22.0	8,969	53,527
Total	....	17,134	297,851

Of the 12 steamboats reported in the last annual report as plying on the Tennessee River between Chattanooga, Tenn., and Florence, Ala., 2, having a total of 163 tons burden, were not in this service during the year, and the number of barges was reduced from 46 to 33.

Four new boats were put on, as follows:

Name of steamboat.	Length.	Width.	Depth.	Net tonnage.	Height of pilot house.	Height of smokestack.	Number of barges.	Capacity of barges.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*		*Tons.*
Buck Lindsay	66	13	4.0	14	20	30.0	1	300
Guntersville	140	29	4.0	204	34	44.5	1	240
India Givens	170	29	4.6	211	35	45.0	....	....
St. Joseph	170	32	4.9	277	35	40.0	....	....

The total number of craft operating in this section of the river during the year ending December 31, 1903, was 14 steamboats, of a total of 2,018 tons burden, net, and 33 barges, of a total capacity of 6,775 tons, as shown on list below.

The steamboats *Avalon*, *India Givens*, *J. T. Reeder*, and *St. Joseph*, a total of 903 tons burden, and 2 barges, total capacity 220 tons, are also reported as plying on the Tennessee River between Florence, Ala., and Paducah, Ky.

List of boats and barges navigating the Tennessee River between Chattanooga, Tenn., and Florence, Ala., during the year 1903.

Name.	Net tonnage.	Barges.		Between what points.	Miles.
		Number.	Tonnage.		
Avalon	361	1	150	Chattanooga and Paducah	463.0
India Givens	211	....	....		
St. Joseph	277	....	....		
American	190	20	4,600	Chattanooga and Florence	208.0
Decatur No. 1	48				
Joe Wheeler	192	3	375	Chattanooga and Decatur	160.0
Sam Davis	93	2	200		
J. R. Gunn	43	1	30	Bridgeport and Lock 1, Muscle Shoals Canal Decatur and Lambs Ferry	137.0 23.5
J. T. Reeder	54	1	70	Decatur and Savannah	115.5
City of Charleston	92	1	600	Elk River and Larkins Landing Shellmound and Pine Island	93.0 54.0
Buck Lindsay	14	1	300	Decatur and Guntersville	53.5
Guntersville	204	2	420	Hobbs Island and Guntersville	22.0
Hattie McDaniels	67				
Huntsville	172				
Total	2,018	33	6,775	....	....

Comparative statement of commerce for the past ten years.

Year.	Tons.	Estimated value.
1894	173,355	....
1895	117,357	$2,099,520.88
1896	131,406	2,686,147.70
1897	247,422	4,078,227.39
1898	224,456	3,578,120.15
1899	253,340	6,118,618.75
1900	229,160	5,499,779.40
1901	129,160	4,584,322.00
1902	137,861	5,567,464.00
1903	297,851	7,439,914.00

Tennessee River between Florence, Ala., and Paducah, Ky.

Articles.	Year ending December 31, 1903.	
	Tons.	Estimated value.
Brick	261	$1,140
Coal	79,000	158,000
Cotton	2,500	600,000
Cotton seed	750	37,500
Fertilizer	1,050	21,000
Flour	4,121	185,467
General merchandise	18,061	2,241,935
Grain	13,180	281,500
Hay	601	12,020
Hoop poles	1,500	12,000
Iron, pig	200	5,600
Live stock	4,150	498,000
Logs	36,926	295,408
Lumber	35,244	440,550
Marble	112	2,240
Peanuts	3,051	396,630
Produce	729	103,481
Railroad ties	579,344	1,622,164
Sand	22,500	15,000
Spokes	16,000	136,000
Staves	15,760	157,600
Stone (monuments)	13,358	1,469,380
Tan bark	260	3,600
Tobacco	100	24,000
Total	848,758	8,720,215

Floated down in rafts, 35,183 tons; number of passengers transported (1903), 29,367.

Details of the traffic for 1903 are shown in the following table:

Between what points.	Miles.	Passengers.	Tons.
Moved in rafts:			
Florence to Paducah	256.9	....	20,090
Riverton to Paducah	226.0	....	4,327
Bear River to Paducah	223.0	....	400
Cerro Gordo to Paducah	177.0	....	332
Saltillo to Paducah	172.0	....	3,402
Clifton to Paducah	158.0	....	1,130
Blounts Landing to Paducah	137.5	....	60
Shipps Landing to Paducah	116.0	....	1,000
Cuba Landing to Paducah	114.5	....	2,000
Duck River to Paducah	110.0	....	1,200
Danville to Paducah	78.3	....	200
Big Sandy River to Paducah	66.3	....	600
Riverton to Savannah	37.0	....	342
Gilbertsville to Paducah	21.5	....	100

Between what points.	Miles.	Passengers.	Tons.
Moved in flatboats:			
Clifton to Paducah	158.0	....	800
East Perryville and Perryville	.8	312	93
Moved by steamboats and barges:			
Chattanooga and Paducah	463.0	600	8,404
Florence and Paducah	256.9	22,840	453,979
Waterloo and Paducah	226.5	....	121,915
Riverton and Paducah	226.0	....	21,875
Big Bend Shoals and Paducah	204.0	5,000	12,554
Shiloh and Paducah	197.5	....	18,427
Savannah and Paducah	189.0	15	6,250
Clifton and Paducah	158.0	....	20,270
Decatur and Savannah	115.5	600	750
Duck River and Paducah	110.0	....	700
Johnsonville and Paducah	96.0	....	42,500
Danville and Paducah	78.3	....	15,375
Big Sandy River and Paducah	66.3	....	5,525
Pine Bluff and Paducah	53.5	....	16,000
Newburg and Paducah	47.5	....	2,358
Mouth of river to foot of Tennessee Island	2.0	....	65,800
Total	....	29,367	848,758

Of the 32 steamboats reported in the last annual report as plying on this section of the river, 5, of a total of 725 tons, were not in this service during the year, but the number of barges was increased from 193 to 270.

Thirteen additional boats were put on, as follows:

Name of steamboat.	Length.	Width.	Depth.	Net tonnage.	Height of pilot-house.	Height of smoke-stack.	Number of barges.	Capacity of barges.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*		*Tons.*
Castalia	110.0	26.2	3.7	90	30	40.0	2	1,500
Fannie Wallace	86.0	13.0	2.9	19	9	15.5	20	10,000
Henrietta	130.0	24.0	4.3	153	40	55.0	7	4,550
Hosmer	95.6	18.4	3.6	52	24	33.0	1	750
India Givens	170.0	29.0	4.6	211	35	45.0	....	....
Lula E. Warren	122.0	22.5	3.3	78	29	39.0	8	1,200
Margaret	142.0	26.0	4.6	201	29	39.0	8	6,000
Mary F. Golden	86.2	16.2	3.6	37	20	25.0	7	1,815
Peter Hontz	100.0	22.0	3.0	100	29	38.0	10	4,000
St. Joseph	170.0	32.0	4.9	277	35	40.0	....	....
Thos. A. Nevins	105.2	33.4	5.2	153	32	40.0	7	3,500
Uncle Sam	109.4	20.0	3.2	57	23	28.0	12	8,250
Woolfolk	141.0	26.0	4.5	105	39	50.0	3	180

The total number of craft operating in this section of the river during the year ending December 31, 1903, was 40 steamboats, of a total of 5,026 tons burden, net, and 270 barges, of a total capacity of 129,254 tons, as shown on accompanying list.

Four steamboats, the *Avalon*, *India Givens*, *J. T. Reeder*, and *St. Joseph*, a total tonnage of 903, and 2 barges, total capacity 220 tons, are also reported as plying on the Tennessee River between Chattanooga, Tenn., and Florence, Ala.

List of boats and barges navigating the Tennessee River between Florence, Ala., and Paducah, Ky., during the year 1903.

Name.	Net tonnage.	Barges.		Between what points.	Miles.
		Number.	Tonnage.		
Avalon	361	1	150	Chattanooga and Paducah	463.0
India Givens	211	....	....		
St. Joseph	277	....	....		
City of Savannah	293	2	400	Florence and Paducah	256.9
City of Memphis	322				
Tennessee	248				
Clyde	335				
Shiloh	140				
J. M. Bowell	94	8	2,800		
Penguin	60	9	2,700		
Victor	100	2	1,140		
Ten Broeck	149	10	1,020		
Russell Lord	186	75	56,250		
J. T. Duffy, jr	146				
Margaret	201				
Pavonia	132				
Inverness	121				
Hosmer	52				
Castalia	90				
John S. Summers	66	12	6,650		
Henrietta	153				
I. N. Hook	55	13	4,680	Waterloo and Paducah	226.5
Wilford	47				
Lyda	92	17	10,625		
Marie J	76				
Uncle Sam	57				
Thos. Parker	50	6	2,400	Riverton and Paducah	226.0
Lula E. Warren	78	8	1,200	Big Bend Shoals and Paducah	204.0
Marie J	....	10	1,000	Shiloh and Paducah	197.5
Victor	....	5	2,850		
Peter Hontz	100	10	4,000	Savannah and Paducah	189.0
L. H. Buhrman	96	4	800	Clifton and Paducah	158.0
Monie Bauer	87	7	2,580		
Woolfolk	105				
J. T. Reeder	54	1	70	Decatur and Savannah	115.5
Key City	59	2	150	Duck River and Paducah	110.0
Mary N	36	12	1,020	Johnsonville and Paducah	96.0
Uncle Sam	....	10	7,000		
Mary F. Golden	37	7	1,815	Danville and Paducah	78.3
Key City	....	1	75	Big Sandy River and Paducah	66.3
Kuttawa	12	2	225	Pine Bluff and Paducah	53.5
Dick Clyde	76	7	3,750	Newburg and Paducah	47.5
Fannie Wallace	19	27	13,500	Mouth of river to foot of Tennessee Island.	2.0
Thos. A. Nevins	153				
Barge	....	1	400	Clifton and Paducah	158.0
Do	....	1	4	East Perryville and Perryville	.8
Total	5,026	270	129,254	....	....

Comparative statement of commerce for the past ten years.

Year.	Tons.	Estimated value.
1894	308,914	....
1895	960,959	$15,966,852.84
1896	864,061	15,192,055.80
1897	390,167	5,572,408.95
1898	602,916	8,388,954.75
1899	462,307	5,592,720.00
1900	1,237,009	6,105,127.40
1901	658,102	6,322,450.00
1902	1,056,270	15,370,604.00
1903	848,758	8,720,215.00

REPORT OF MR. J. E. HALL, SURVEYOR.

CHATTANOOGA, TENN., *March 25, 1904.*

CAPTAIN: I have the honor to submit the following report of operations of the United States dredging plant on the Tennessee River, below Riverton, Ala., from the beginning of the present fiscal year to October 20, 1903, on which date the plant was retired from commission on account of lack of funds.

The plant consisted of the U. S. dredge *Kentucky*, a four-yard dipper dredge built by the Bucyrus Company; three dump scows, each having a capacity of 100 cubic yards; two deck barges, and other necessary appliances. The U. S. steamer *Lookout* was used for moving the plant and also served as dredge tender. The plant was laid up during the preceding winter at Muscle Shoals Canal, and began operations April 8, 1903.

The plan for the season's work was to take up the improvement of Sweetwater bar, near Florence, Ala., while the dredge was above Colbert shoals, and complete it if possible before the river got too low for passage over the shoals; to proceed from there to Rockport Bar, 121 miles below Riverton, and after reopening the channel there to return to Big Bend shoals and work out the remainder of the appropriation at that place.

In pursuance of this plan, the plant, after completing the improvements at the first two places mentioned above, reached Big Bend shoals on June 30.

BIG BEND SHOALS.

This obstruction begins opposite the mouth of Chambers Creek, about 21 miles below Riverton, and extends to Hamburg, Tenn., its total length being about 15,000 feet. It consists of a succession of rock ledges and reefs, which are so situated as to render the channel very tortuous and shallow, the greatest depth at low water being only about 26 inches. The width is about normal, but the fall is excessive, being nearly 2 feet per mile.

Hamburg, at the foot of these shoals, has always been considered the head of low-water navigation. The large boats stop at this place during the period of extreme low water and transfer freight intended for points farther up the river to a light-draft boat which then plies between Hamburg and Riverton. The needs of commerce having been adjusted in this way, the improvement of obstructions below this place, all of which were less formidable (their improvement also adding more to the navigable length of the river), were first undertaken.

A survey of Big Bend shoals was made in August, 1902, and an examination made of the reefs and ledges which obstruct the channel. This revealed a variety of material; limestone, sandstone, and conglomerate ledges were found in the channel and near the right shore, but the outcrop on the left shore was conglomerate and shale. The water at that time was too deep to permit a minute examination.

The dredge reached this place on June 30 and was ready for work on July 7; the intervening time having been spent in repairing the rock dipper and getting ready for hard digging. It began work in the projected channel at the upper end of the shoals where it encountered ledges of hard blue limestone. These ledges proved to be so hard and thick that the dredge could not break them up. It then moved down in the line of the projected channel, trying the ledges; but before reaching the upper light the dipper handle broke. It became evident that the material here could not be moved without the aid of explosives, and as the water was then too high for blasting it was decided to move the plant to Beech Creek Island.

The amount available for work below Riverton at the beginning of the fiscal year was $6,332.15. While this amount would do but little more than begin the improvement at Big Bend shoals, it was sufficient to complete the improvement at Beech Creek. In consideration of this it was decided to move the plant at once to that obstruction.

BEECH CREEK ISLAND (153 MILES ABOVE PADUCAH).

Beech Creek Island divides the river into two chutes, and is located in a large semicircular bend to the left.

The left chute is the boat channel, and it is obstructed by a large gravel bar which seems to have been at one time a part of the island. This made a sinuous channel, a descending boat having to pass between the bar and the right shore, and at the head of the island turn squarely toward the left shore, then back again to the former direction. It was difficult for boats with tows to make these turns, and they were constantly grounding.

In the season of 1900 the dredge opened a channel around the point between the left shore and the obstructing bar, but this channel being on the convex side of the river in an eddy, it filled during the following high-water season, and the boats were forced to return to the old way of running.

By comparing the survey of 1895 with the more recent surveys, it was found that a change was taking place along the left shore of the island, and that the bar on the left, which was a part of the island in 1895, was now detached and the chute between it and the island constantly widening. It was then decided to open a channel in this direction, and to cut away a part of the upper bar so as to form an entrance to, and also straighten, the channel.

The dredge began work on the upper bar July 21 and completed its removal September 1. The upper side of this bar was composed of cemented gravel and loose rock. This class of material was deposited in the right chute in order to throw as much water as possible into the steamboat channel. This chute, by this means, was almost closed at low water. The remainder of the bar, consisting of sand and gravel, was dumped partly near the right shore among the rocks and partly near the left shore above the light.

Excavation made July 21 to September 1.

Gravel and sand .... cubic yards..	42, 100

After completing the removal of the upper bar the dredge began on the new channel between the detached bar and the island. Three cuts were made parallel to the left shore of the island, each 1,700 feet in length. The river had then fallen so low that it was necessary to cast aside the first cut for its entire length, as there was not enough water to permit the use of the scows. The material from the second cut was taken out through the first cut until about halfway down, where it became shoal—filling with the material loosened by the dredge and the overflow from the dipper. It was reopened and the second cut then completed. The third cut was made without difficulty until about 500 feet above the end, where the same trouble was encountered. The second cut was then reopened and the third one completed.

The dredge now returned to the upper end, and beginning at the lower corner of the upper bar cast aside material forming a dam 2 feet above water from there to the detached bar, forcing the entire river down the new channel. This caused all of the material which had been loosened to scour out, leaving open a channel having a clear width of 120 feet, with a 6-foot depth at low water. The large rock near the mouth of Beech Creek, containing about 200 cubic yards, was also blasted and removed.

Excavation made September 1 to October 20.

Gravel and sand .... cubic yards..	67, 600

The following is a tabulated statement of work done from the beginning of the present fiscal year until the dredge was retired from commission:

	Days.
Time at work:	
Dredging gravel, sand, and soft material	62
Dredging rock	4
Total	66
Time lost:	
Sundays	16
Holidays	2
Traveling	14
Accidents	14
Total	46
Time at work	66
Time in commission	112

Nature of work.	Average per day.	Total during season.
Gravel and loose material excavated .... cubic yards..	1, 769	109, 700
Rock excavated .... do....	75	300
Total .... do....	....	110, 000

Dredge in commission.

Cost of equipment and repairs:	
Per day in commission	$3.47
Per day of work	5.88
Total	388.44
Cost of fuel:	
Per day in commission	6.95
Per day of work	11.80
Total	774.29
Salaries and subsistence:	
Per day in commission	34.51
Per day of work	58.58
Total	3,865.90
Total cost:	
Per day in commission	44.90
Per day of work	76.19
Total	5,028.63
Cost per unit:	
Per cubic yard of gravel, sand, etc	.043
Per cubic yard of rock	1.015
Per cubic yard of material excavated	.045

* * * * * * *

In relation to the dredging operations carried on for several seasons on the Tennessee River below Riverton, I have the honor to offer the following remarks on the condition of the places which have been improved, beginning at the mouth of the river and taking them in their upstream sequence:

HEAD OF TENNESSEE ISLAND (1 MILE ABOVE PADUCAH).

This obstruction was formed after the survey of 1895, from which the general maps were made. It was a sand bar deposited by the Ohio River, and almost closed the channel between the island and the left shore. A channel 200 feet wide and 6 feet deep at low water was opened through the bar in 1901. It is still open, but under certain conditions is likely to fill again.

BIG CHAIN BAR (14 MILES ABOVE PADUCAH).

The obstruction at this place consisted of rock ledges at the upper end, just below which was a long, flat gravel bar. The river here spread to almost double its average width. The improvement at this place consisted of removing 66,345 cubic yards of material in 1900 and 1901, and depositing it below the ledges near the shores (the channel being in the middle of the river), thus contracting the cross section and distributing the fall over a longer stretch. This place shows no sign of filling and will doubtless remain open, although a bar seems to be forming about one-half mile below.

HEAD OF TWENTY-SEVEN-MILE ISLAND (27 MILES ABOVE PADUCAH).

The improvement at this place was effected by the removal of a cemented gravel bar which divided the channel, leaving a narrow chute on either side. This place was improved in 1899 and shows no sign of filling.

GRUBBS TOWHEAD (31 MILES ABOVE PADUCAH).

The channel here was contracted by a cemented gravel bar extending from the towhead. The channel was widened in 1900 by four cuts through this bar. This improvement is also of a permanent nature.

HIGHLAND BAR (43 MILES ABOVE PADUCAH).

The obstruction here was similar to the one at Grubbs Towhead, being a bar extending from Pentecost Towhead into the channel, with a second bar jutting out from the left shore, making the channel narrow and crooked. This place was improved in 1900 and shows no sign of shoaling.

BLOOD RIVER ISLAND (51 MILES ABOVE PADUCAH).

The improvement here consisted of the removal, in 1901, of 450 cubic yards of cemented gravel rock near the channel. No further work will be needed here.

PANTHER CREEK ISLAND (59 MILES ABOVE PADUCAH).

The work done at this place in 1899 was insufficient, as the channel is still obstructed by a bar just below where the work was done.

HEAD OF SANDY ISLAND (69 MILES ABOVE PADUCAH).

The improvement here was effected by the removal of 15,450 cubic yards of loose and cemented gravel in 1899, 1900, and 1901. The improvement is likely to be permanent.

LEATHERWOOD SHOALS (73 MILES ABOVE PADUCAH).

This place is still in need of dredging, as the improvement made here in 1899 was not carried far enough. There is now over this bar only about 3.3 feet at zero of Johnsonville gauge.

WHITE OAK ISLAND (82 MILES ABOVE PADUCAH).

The channel at this place is still open, showing no change since the improvement was made in 1899.

TURKEY CREEK ISLAND (85 MILES ABOVE PADUCAH).

The improvement here consisted in the removal, in 1900, of several cemented gravel lumps which were near the channel. No further work will be needed here.

GREEN BOTTOM BAR (89 MILES ABOVE PADUCAH).

The river here spreads to almost double its normal width, and is divided into three chutes by two bars, the channel being down the right shore. A channel 150 feet wide and 5 feet deep was opened here by the removal of 25,750 cubic yards of material. This improvement was made in 1900 and shows no sign of filling.

REYNOLDSBURG ISLAND (92 MILES ABOVE PADUCAH).

The channel was narrowed here by a bar from the left shore at the mouth of Cypress Creek. In 1900, 12,900 cubic yards of gravel were removed. Improvement probably permanent.

JOHNSONVILLE (96 MILES ABOVE PADUCAH).

Additional work is needed at this place. The project contemplated the removal of 42,000 cubic yards, and only 19,000 have been removed (in 1900).

DUCK RIVER SUCKS (105 MILES ABOVE PADUCAH).

This place was improved in 1900 by the removal of 24,000 cubic yards of material. No change is noticed since the work was done.

ROCKPORT BAR (106 MILES ABOVE PADUCAH).

This place has been improved each season, and will probably continue to need annual improvement.

DOUBLE ISLAND (148 MILES ABOVE PADUCAH).

The channel here was obstructed by a gravel bar formed by several ledges of cemented gravel rock. This place was improved in 1901 by the removal of 3,700 cubic yards of material, and the improvement is probably permanent.

BEECH CREEK ISLAND (153 MILES ABOVE PADUCAH).

A channel was opened at this place in 1900, but filled during the following high-water season. A second channel was opened during the past season in another direction. The effect of high water on this improvement has yet to be ascertained.

WOLF ISLAND (193 MILES ABOVE PADUCAH).

The river is here divided by the island into two chutes of almost equal size; the left chute being the boat channel. The improvement here was effected by removing the several obstructions; a bar just above Crumps Landing, a bar one-half mile below landing, and a number of jutting points of cemented gravel rock. The improvement was made in 1901 and is still in good condition.

DIAMOND ISLAND (196 MILES ABOVE PADUCAH).

The improvement at this place was effected in 1901 by the removal of a gravel bar formed by deposit from Snake Creek, and two wrecks—one of the steamer *Rapidan* and the other of an ammunition barge. The channel here is still open, but the bar may, under certain conditions, re-form.

* * * * * * *

In connection with the foregoing report I respectfully add the following estimate of the approximate amount of dredging necessary on the Tennessee River below Riverton in order to have a 5-foot channel at low water. This estimate was prepared in February, 1898, from the general maps, and gives the number of existing obstructions, their location, and the number of cubic yards to be removed at each place in order to obtain the projected improvement.

Since this estimate was prepared dredging has been carried on during four seasons, and a number of the most serious obstructions have been improved. The following table gives the estimate mentioned and the amounts dredged during the four seasons in which work has been done since the estimate was prepared:

Name of locality.	Distance above Paducah.	Amount estimated Feb. 10, 1898.	Amount of work since done.			
			1899.	1900.	1901.	1903.
	Miles.	*Cubic yds.*	*Cubic yds.*	*Cubic yds.*	*Cubic yds.*	*Cubic yds.*
Head Tennessee Island	1	....	....	....	52,300	....
Big Chain bar	14	16,716	....	13,100	53,245	....
Head 27-Mile Island	27	11,214	11,007	....	....	....
Grubbs Towhead	31	11,160 G	....	10,000	....	....
Reynolds bar*	38	21,686 G	....	....	....	....
Pentecost Island	42	16,066	....	....	....	....
Highland bar	43	27,461 G	....	26,800	....	....
Newburg Landing	47	29,142 G	....	....	....	....
Blood River Island	51	2,000 G	....	....	450	....
McCullochs bar*	56	9,300 G	....	....	....	....
Panther Creek Island*	59	19,947 G	10,200	....	....	....
Mouth Sandy River	66	4,000 G	....	....	....	....
Head Sandy Island	69	20,442 G	3,550	10,300	2,600	....
Leatherwood shoals*	73	8,800 G	5,995	....	....	....
Hurricane Island	76	4,000 G	....	....	....	....
Danville bar	78	4,778 G	....	....	....	....
White Oak Island	82	7,919 G	3,410	....	....	....
Turkey Creek Island	85	4,000 R	....	400	....	....
Green Bottom bar	89	17,918 G	1,020	24,550	....	....
Reynoldsburg Island	92	8,843 G	....	12,900	....	....
Johnsonville Landing*	96	42,479 G	....	19,000	....	....
Bird Song Creek	103	2,000 G	....	....	....	....
Duck River Sucks	104	....	....	16,500 G	....	....
Do	105	6,131 R	....	7,570 R	....	....
Rockport bar	106	13,321	13,163	31,900 G	16,100	19,100
Duck River	110	3,000	....	....	....	....
Densons Island*	125	2,078 G	....	....	....	....
Parsons Landing	127	2,000 R	....	....	....	....
Beech River	135	3,055 G	....	....	....	....
Webbs Landing	137	30,527 G	....	....	....	....
Cedar Creek bar*	141	7,497 G	....	....	....	....
Armstrong Towhead	143	4,695 G	....	....	....	....
Double Island	148	3,882 G	....	....	3,700	....
Buffalo shoals	152	2,000 R	....	....	....	....
Beech Creek Island	153	34,948 G	....	64,800	....	109,000
Eagles Nest Island	164	4,008 G	....	....	....	....
Swallow Bluff Island	170	2,000 R	....	....	....	....
Wolf Island	193	38,352 G	....	....	37,800	....
Diamond Island	196	8,027 G	....	....	19,500	....
Hamburg Landing	202	6,139 G	....	....	....	....
Big Bend shoals	204	43,341 G	....	....	....	....
Do	206	24,913 R	....	....	....	100
Duncans Landing	210	16,824 G	....	....	....	....
Winns Landing	213	2,000 G	....	....	....	....
Head State Line Island	217	1,000 G	....	....	....	....
Indian Creek	220	1,000 G	....	....	....	....
Bear Creek shoals	224	28,242 G	....	....	....	....
Eastport Landing	225	7,963 G	....	....	....	....
Waterloo Landing	226	8,055 G	....	....	....	....
Riverton bar	226	22,222 G	....	....	....	....
Riverton Landing	226	36,728 G	....	....	....	....
Total	....	653,819	48,345	237,820	185,695	128,200

Localities marked * are important and should receive prior attention. G, gravel; R, rock.

It is evident from the foregoing that 600,060 cubic yards of material have been removed during the four seasons' work of 1899, 1900, 1901, and 1903. Much of this, however, was due to maintaining a channel through bars that are constantly forming, notably Rockport bar, which has been dredged each season, the amount removed in each instance being equal to or in excess of the original estimate. Then, too, 109,000 cubic yards were removed in dredging a new channel at Beech Creek Island under a project not contemplated in the 1898 estimate, and over 50,000 cubic yards from the bar formed at the head of Tennessee Island since the survey was made upon which the estimate was based.

At the close of the season's work of 1903, which completed the removal of the most serious obstructions in the lower section, the plant was towed to Lock 6, Muscle Shoals Canal, where it can be cared for economically during the period of inaction.

Respectfully submitted.

J. E. Hall,
Surveyor.

Capt. W. J. Barden,
Corps of Engineers.

C C 2.

OPERATING AND CARE OF MUSCLE SHOALS CANAL, TENNESSEE RIVER.

Full details of the year's operations are given in the appended report of Mr. W. S. Winn, assistant engineer in charge of the work.

The hydraulic machinery for operating the gates and valves at Lock A has continued to give trouble, and cost more this year for repairs than all the hand-maneuvering appliances at the remaining ten locks. In making these repairs it was discovered that the masonry walls of the turbine pit rest on timber foundations that are decaying, and will probably require extensive repairs in the near future.

In a number of cases there is considerable leakage around the lower part of the heel posts where the hollow quoins have been badly worn by the passage of water. The lock walls at the ends of the drop gates used at Locks 5, 6, 7, 8, and 9 are also considerably worn, so that the form of joint employed is not effective in preventing leakage. There are also important leaks through the canal embankment in every pool. Eighty-one of these were dug out and refilled with clay.

The bucket dredge *Alabama* was put in commission in October, before its repairs were completed, on account of the urgency of some of the work to be done. It dredged about 100,012 cubic yards, at an average cost of 3 cents per cubic yard. While the dredge was undergoing repairs the entrance to the lower canal above Lock 1 was partly cleared of an accumulation of mud with the aid of the wheel of the U. S. towboat *Colbert*.

Further experience with gravel ballast on a portion of the railroad indicates the advisability of substituting it for the coarse stone ballast, as a matter of economy in maintenance of way. The two locomotives have been put in thorough repair and equipped with steam brakes and spark arresters. Four of the seven flat cars have been practically rebuilt with material from the scrap pile.

Three of the five cribs proposed have been built to furnish points of support for the telephone line where it crosses the river at Lock 1. When completed these will shorten the spans of wire from about 1,300 feet to about 500 feet, and hold the wire high enough to prevent damage by drift during flood stages.

About 81,503 feet B. M. of lumber were manufactured in the sawmill, at an average cost of $12.27 per 1,000 feet. The cost in the market would probably have been at least $25 per 1,000, as much of this was white oak of first-class quality.

The 40 buildings on the canal (exclusive of small outbuildings) were kept in repair at an average cost of $49.87 per building.

Necessary repairs were made to the floating plant, including the rebuilding of derrick boat *No. 3* and the completion of the reconstruction of the bucket dredge *Alabama* (heretofore called *Bucyrus*), from the special allotment of $8,000 made for the purpose in 1902.

A special allotment of $605 was made May 23, 1904, to purchase a strip of land used as a roadway leading from the United States reservation at the canal headquarters at Lock 6 to the public highway leading to Florence. The transfer of the land to the United States has been nearly completed.

ABSTRACT OF ALLOTMENTS.

November 28, 1890	$40,000.00
July 1, 1891	31,792.04
July 1, 1892	45,232.90
July 1, 1893	60,975.19
July 1, 1894	63,772.63
July 1, 1895	64,793.11
July 1, 1896	62,707.46
July 1, 1897	67,979.55
July 1, 1898	62,868.17
July 1, 1899	59,239.20
July 1, 1900	63,000.00
July 20, 1900, to cover deficiency	355.95
November 2, 1900, to repair dam above Lock A	4,500.00
July 1, 1901	62,930.65
April 12, 1902, to repair storm damage	30,000.00
July 1, 1902	60,529.19
August 7, 1902, to rebuild hull of dredge	8,000.00
November 6, 1902, to purchase land	1,200.00
July 1, 1903	61,016.78
May 23, 1904, to purchase land	605.00
Total	851,497.82

Estimate of funds needed from appropriation for operating and care of canals and other works of navigation (indefinite), to be applied to current expenses in operating the Muscle Shoals Canal from July 1, 1904, to June 30, 1905.

Amount required for fiscal year ending June 30, 1905	$62,000.00
Balance remaining from allotment of preceding year, not including special allotment of $605 for purchase of land	79.22
Additional allotment needed for fiscal year ending June 30, 1905	61,920.78

Summary of expenditures for operating and care of Muscle Shoals Canal for the fiscal year ending June 30, 1904.

Office and administration	$5,858.80
Operating and care of locks	7,013.60
Dredging, maintenance of embankment, etc	7,023.50
Buildings, grounds, etc., including machine shop, sawmill, and dry dock	7,085.73
Railway: Repair and operation	7,854.56
Towboat crews	2,709.46
Subsistance of employees	7,579.20
Supplies: Fuel, oil, rope, etc	6,782.34
Repair of dredge and plant, material, and contingencies	10,013.59
Total	61,920.78

Money statement.

July 1, 1903, balance unexpended	$6,714.02
Allotment for fiscal year ending June 30, 1904	61,016.78
June, 1904, allotment for purchase of land	605.00
	68,335.80
June 30, 1904, amount expended during fiscal year, for maintenance of improvement	63,221.87
July 1, 1904, balance unexpended	5,113.93
July 1, 1904, outstanding liabilities	5,034.71
July 1, 1904, balance available	79.22

ABSTRACT OF CONTRACTS IN FORCE.

1. Contract with Crow Brothers, of Florence, Ala., for furnishing one year's supply of fresh meat, delivered semiweekly, from March 11, 1904, to March 10, 1905.

Contract dated February 19, 1904; approved February 26, 1904.

Prices: Fresh beef, 6 cents per pound; fresh mutton, 5 cents per pound; fresh pork, 5 cents per pound.

2. Contract with D. L. Harrison, of Killen, Ala., for furnishing one year's supply of fresh provisions, delivered semiweekly, from April 15, 1904, to April 14, 1905.

Contract dated April 9, 1904; approved April 22, 1904.

Prices: Fresh butter, 24 cents per pound; fresh eggs, 17 cents per dozen; potatoes, $1 per bushel; onions, $1 per bushel.

COMMERCIAL STATISTICS.

Statement of traffic through the Muscle Shoals Canal during the calendar year 1903, compared with the traffic for the calendar years 1900, 1901, and 1902.

Craft, etc.	Year ending December 31—			
	1900.	1901.	1902.	1903.
Steamers ... number..	409	295	173	216
Barges ... do....	419	233	162	255
Rafts ... do....	7	6	2	2
Miscellaneous craft ... do....	12	18	18	19
Total tonnage	69,679	73,702	28,530	47,811

Articles.	Year ending December 31—				Estimated value, 1903.
	1900.	1901.	1902.	1903.	
	Tons.	*Tons.*	*Tons.*	*Tons.*	
Brick				18	$79
Coal	212	25	60	174	435
Cotton	847	304	701	1,204	288,840
Cotton seed	804	945	1,271	970	20,370
Fertilizer				677	13,540
Flour	5	20	1	38	1,710
General merchandise	2,594	4,093	3,140	2,537	317,125
Grain	268	391	287	1,319	34,949
Gun carriages				35	5,005
Live stock	36	5	6		
Logs		60	48	52	416
Lumber	7,049	2,616	326	490	6,125
Machinery				27	8,100
Produce			286	99	7,585
Railroad ties				2,189	6,623
Staves	1,000	440	74	30	180
Wood	2,066	3,026	1,512	712	1,068
Total	14,881	11,925	7,712	10,571	712,150
Passengers transported ... number..	7,962	8,901	1,370	3,988	

Number of lockages (1903), 2,229.
The above is exclusive of supplies carried by Government steamers.

REPORT OF MR. W. S. WINN, ASSISTANT ENGINEER.

UNITED STATES MUSCLE SHOALS CANAL,
Kingman, Ala., June 30, 1904.

MAJOR: I have the honor to submit the following report of work done in connection with the operation and care of Muscle Shoals Canal for the fiscal year ending June 30, 1904:

The same classification of work that has been used for the past seven years in the annual reports on this work will be adopted for this report, and is as follows:

Canal.—Operation and care of locks and similar structures, maintenance of embankment, and dredging and care of canal trunk.

Railway.—Maintenance of way; rolling stock, repairs, etc., and operating expenses.

Telephone line.—Operation and repairs.

Machine and blacksmith shops and foundry.—Operation and repairs.

Sawmill and carpenter shops.—Operation and repairs.

Buildings.—Improvements and repairs.

Quarters and grounds.—Care of, etc.

Floating plant.—Operation and repairs.

Dry dock.—Operation and repairs.

Miscellaneous expenses.

CANAL.

Operation and care of locks, etc.—The hydraulic machinery for maneuvering gates and valves at Lock A again, as in previous years, came in for the major part of repairs to maneuvering apparatus. During the past year such repairs at Lock A cost more than at the other ten locks combined. The machinery at Lock A had become so badly worn that it had to be brought to the machine shop to be repaired. Many of the parts had to be made new, and such parts were made of brass where that metal gave a better construction than cast iron, which was originally used. To get at the machinery in the pump well, it was necessary to place a plank dam across the head race. When that was done and all the water was out, I discovered that the walls of the well and pit are built upon timber foundations, the timber reaching up to the low-water level of the pool above the lock. The timber of the foundations has rotted and given way, already disclosing cracks in the masonry above which in time will become so bad as to cause the whole walls to be rebuilt. The records of this office show that wall reaching from the lock about 100 feet above the mouth of the race was originally built in the same manner, on timber foundations, and had to be rebuilt in 1898. The impending necessity for rebuilding the walls is another reason for substituting hand-power maneuvering appliances for the hydraulic machinery, as referred to in my last annual report.

The inlets of the upper culverts at Lock A are covered with wood grating. This had become broken in places and had let into the culverts so much trash that cofferdams had to be placed around the inlets, the lower pool drained, logs and trash cleaned out, and new grating put in. The tops of the upper miter posts were replaced where they had rotted down to low water.

Leaks around valve frames, under the cushion sticks on lower sills, and behind heel posts at Lock B had become so great as to interfere with operating the gates. Accordingly, when the water was at its lowest in October a temporary timber and canvas dam was built below the lock, and with two centrifugal pumps installed on barges the water was pumped out of the lock pit. A trench was cut through the embankment above the lock to divert the leakage from Lock A and a spring branch that flows into the level. Leaks between the timber cushions and the stone sills were stopped by driving in poplar wedges; those around the valve frames were filled in with rich cement mortar. No attempt was made to stop the leaks behind the heel posts. The best way to stop these leaks would be to fill in the worn places in the stones with cast-iron plates; but as no such plates were on hand at the time of the above repairs, and since to make and put them up would cause a further delay of about two weeks to the steamer *Gunn*, which was making weekly trips through Lock B, it was thought best to defer putting the plates on until some future time. As it was, the *Gunn* missed only one trip, and as its cargoes at that season were light it easily made up on the next trip.

In this connection it may be well to note that there are leaks behind every heel post on the canal, some of them large enough to require repairs soon. During the next low-water season it is proposed to sheathe the bottom of the hollow quoins of one or more of the interior locks, where the result can be observed with little trouble, and if it proves a success, to apply the same remedy to all the rest. The iron plates can be made in the foundry here, and largely of scrap on hand, so the cost will be small.

All of the metal lock gates at the lower division were scraped and painted. The lower gates were not painted below the normal level of the lower pool, it being intended to give that part of the gates a coat of coal tar and pitch when low-water season comes on and traffic through the canal is least liable to be interfered with by draining the pools to do the work.

When the river gets below the 5-foot mark on the Lock 1 gauge, all the Lock 1 gates are usually opened in order to get plenty of water to keep up the pool levels below. When the gates are open mud is deposited on the upstream sides of the sills, so that it has to be scraped away before the gates can be closed. The water has been low so much this year that it has been necessary to clean the mud away five times. Scraping away was also necessary once at Locks B, 2, 3, 4, and 8.

The shaft of one of the valves at Lock 3 twisted in two, and had to be filled and welded. One valve at each of Locks 3, 5, and 6 had to be refastened to shaft. Drop gates at 5, 7, 8, and 9 had two more air tanks added to each gate to reduce strain on raising gear. The lock walls at the end of all the drop gates are worn badly. In some places the stone has been eaten into 1½ inches from the original face of the wall, and a sheet of water leaks around the ends of drop gates whenever the locks are empty. The joint between the end of drop gate and face of wall is made by a loose gas pipe mounted on a fixed rod, the latter being smaller in diameter than the inside diameter of the pipe. When the gate is up and there is a head on it the pipe is forced into the angle between the gate and wall. When the lock is full the pipe falls back on the rod so the gate can be manipulated without scraping the face of the wall. The joint has never been very satisfactory. Very small particles of drift sufficed to hold the pipe away from the wall, and the leakage so produced soon eroded the wall. The erosion at Lock 7 was so bad that the pipe wedged in between the gate and the wall and jammed so tight that the pool above had to be drained before the gate could be worked. Iron plates are on hand to be let into the walls at the ends of the drop gates, flush with the faces of the walls. The plates will be put on during the next low-water season.

A number of other minor repairs made on locks and similar structures are included in the following statement:

DETAILED STATEMENT OF REPAIRS TO LOCKS AND SIMILAR STRUCTURES.

Lock A.—Repaired hydraulic machinery; replaced upper halves of upper miter posts, cleaned out culverts, and put new grating over upper opening on one culvert; painted snubbing posts, guy rods, and anchor posts.

Lock B.—Built temporary dam, pumped water out of lock and stopped leaks around valve frames and under cushion sticks on sills; gave that part of the lower gates below low water a coat of pitch; repaired gate spar; painted snubbing posts, guy rods, and anchor posts; cleaned drift out of all valves.

Lock 1.—Scraped mud away from above sills so gates could be opened; drilled holes in horizontal I beams so water would not stand on them; scraped and painted gates.

Lock 2.—Scraped and painted gates; repaired walk ways and flashboards; refastened valve to stem; rebuilt valve covers; scraped mud away from above sills; cleaned drift out of culverts and from between gate sill and mud sill.

Lock 4.—Scraped and painted gates; repaired walk ways and flashboards; cleaned drift out of culverts and from between gate sill and mud sill.

Lock 5.—Scraped and painted lower gates and repaired walk ways; repaired maneuvering gear of drop gates and put in cover over machinery well; refastened valve to shaft.

Lock 6.—Scraped and painted lower gates; filled in leaks around valve frames and around hinge straps of drop gates.

Lock 7.—Scraped and painted lower gates; welded valve shaft and repaired drop gate.

Lock 8.—Scraped and painted lower gates; scraped mud away from above sills; put two additional air tanks on drop gates.

Lock 9.—Scraped and painted lower gates; put two additional air tanks on drop gate and repaired its maneuvering gear.

Aqueduct.—Painted I beams and timber guard rails of bridge; repaired valve under east abutment.

Drift sluice.—Repaired masonry of abutments; removed drift and stone from outlet.

Masonry weirs at Second, Bluewater, and Six Mile creeks had valves repaired to stop leakage.

Unit cost of operating and care of locks.

Month.	Cost per lock.	Vessels through canal.	
		Number.	Cost per vessel.
1903—July	$38.20	15	$28.01
August	60.04	17	38.85
September	71.02	13	60.10
October	75.20	12	68.93
November	50.23	25	22.10
December	52.91	23	25.30
1904—January	43.74	20	24.05
February	47.02	17	30.42
March	45.03	22	22.52
April	48.05	27	19.58
May	58.91	29	22.35
June	47.29	31	16.78
Average per month	53.13	21+	27.94

Total number of lockages, including those for craft belonging to the United States, 1,950.

Maintenance of embankment and care of canal trunk.—Drift was removed from the lateral dam above Lock A for a mile of its length once, and for a short distance two or three times more. Only one run of drift into the canal above Lock A of any consequence occurred, and that was gotten rid of without difficulty. Drift runs into the head of the upper canal only at high stages and with the wind blowing from the north. The prevailing low stages of the river during the past year were in the canal's favor.

During the year leaks caused the top of embankment to cave in at Lock 3 and in sections 5, 20, and 21. They were discovered and stopped in every instance before serious damage was done. Eighty-one leaks in the bottom and sides of canal trunk were dug out and refilled with clay in sections 5, 8, 15, 17, 21, and 29. It seems that no great care was taken in putting suitable material into the bottom of the canal trunk and in its embankments when the canal was built. Large stones, logs, and trash were dumped in indiscriminately, and the result is that there are leaks in every pool. It is the aim to stop some of these leaks every year and gradually work the canal trunk up to its highest efficiency. Formerly, leakage would have reduced the limits of the canal's capacity far below what it should be. For instance, the pool between Locks 2 and 3 would have run dry in about three and one-half hours with the feed at Lock 2 shut off. Many of the leaks stopped during the year were in that level, and the work improved it greatly.

Another of the leakiest places on the canal was just above the aqueduct, where a wall of the old Alabama State Canal, backed by light earth back filling, forms a part of the embankment connecting the aqueduct with the bluffs. All of the joints in the old wall were open. The mud was dug away from the face of the wall down to the foundation, and the most open joints of the masonry were calked with cement mortar. Even after that was done enough water crept through, and, collecting between the wall and back filling, broke out in a leak as large as a man's body. Then an embankment was built behind the wall of such strength that it would hold the water independently of the wall. A dry wall 300 feet long, to serve both as a guide wall to the lock and as a retaining wall at the foot of the embankment, was built below Lock 7. A similar wall below Lock 6 was rebuilt. The river side of the embankment at Lock 4 was strengthened and graded. About 300 cubic yards of riprap were placed on the river slope of the embankment below Lock 7. Timber revetment along the sides of the lower canal, near the head and above Lock A, were built to prevent dredge mud from flowing back into the canal.

Before the dredge was ready to go into commission the throat of the canal above Lock 1 became so filled with mud that it was not only impassable for boats, but would not let enough water into the canal to keep all the pools full and the sawmill and carpenter shop turbines going. The *Colbert* was taken there, and after it had been pulled through the mud to the river came back through the trough it had made, and by tying its head every few feet and working its wheel (under full head of steam) back and forth across the canal fanned the mud out into the river. By that process a channel was made that would let any boat into the canal that could pass over the shoals in the open river just above. The channel so made extended from the river about 100 feet into the canal.

Other work done under this head comprised ditching at foot of embankment where material thrown over by the dredge backed water upon fields of private individuals; cutting weeds and bushes on embankment and cleaning drift from canal trunk.

Unit cost of maintenance of canal trunk and embankment.

Month.	Cost per mile of canal.[a]	Vessels through canal.	
		Number.	Cost per vessel.
1903—July	$4.24	15	$5.09
August	28.22	17	29.88
September	36.15	13	50.05
October	7.86	12	11.78
November	21.75	25	15.66
December	3.81	23	2.98
1904—January	8.80	20	7.92
February	4.73	17	5.01
March	4.07	22	3.33
April	12.73	27	8.49
May	33.33	29	20.68
June	22.77	31	13.29
Average per month	15.71	21+	13.52

[a] Length of canal trunk, 18 miles.

Dredging.—Owing to delay in getting lumber and, later on, parts of machinery ordered from the builders (the Bucyrus Company), the dredge did not get to work until October 15. Even then it was put to work with some badly worn parts in lieu of those not received from the builders. It was taken to the head of the canal, where it dredged out the mouth of the canal from the river as far in as the discharge pipe would work over the embankment at that stage of the river. It was delayed in November and December on account of water being too low to get a supply of coal, and again in February to put new liners in discharge pipe and adjust hopper and other parts of machinery. Since then it has put in steady time. The following table gives, by months, the work performed by the dredge and its cost, which includes wages of operatives, running repairs, and material expended.

Statement of dredging.

Month.	Classification.	Wages of operatives, cost of material expended, and running repairs.	Cubic yards dredged.	Cost per cubic yard.
1903—October	Mud, gravel, etc	$273.34	5,700	$0.048
November	do	117.05	1,160	.100
December	do	333.76	6,450	.051
1904—January	do	293.43	13,395	.022
February	do	89.88	3,000	.029
March	do	442.90	16,785	.026
April	do	464.71	19,451	.023
May	do	513.36	21,601	.024
June	do	471.86	12,470	.038
Total		3,000.29	100,012	.030

RAILWAY.

Maintenance of way.—During the year previous, gravel ballast dredged from Bluewater and Second creeks was put on about 5 miles of the track. It has proven to be an ideal ballast for holding the track in shape, keeping down weeds, and rendering those that do grow easier to pull than those in the old ballast of limestone. While weeds and grass had to be pulled from the old ballast four or five times, twice sufficed for the gravel ballast, and it was accomplished in half the time required for covering the same space in the old ballast. This may have been partly due to the fact that the gravel was fresh from the creeks, and weeds and grass had not had time to take hold in it. It will be watched this summer, and a comparison at the end of the season will show the relative merits of the two kinds of ballast as concerning keeping weeds and grass out of the track. Cinder ballast was put in track in lock premises at Locks 4 and 5. Iron work and guard rails on bridges over Shoal, Bluewater, Second and Six Mile creeks and Douglass and Helltown branches were painted. Other work under this head was the renewal of cross ties, tamping ties, surfacing track, cleaning out weeds and grass, etc.

Unit cost of operation and maintenance of railway.

Month.	Cost per mile for maintenance of track.[a]	Miles run by engines.	Cost per engine mile.[b]
1903—July	$31.16	1,830	$0.090
August	27.54	1,786	.093
September	30.10	1,718	.090
October	3.33	2,092	.069
November	.15	1,714	.095
December	34.05	1,996	.076
1904—January	26.95	1,754	.093
February	5.53	1,256	.126
March	16.87	1,680	.103
April	10.87	2,046	.104
May	11.39	1,767	.091
June	31.98	1,776	.089
Average per month	19.16	1,785	.092

[a] Length of track and sidings, 16 miles.

[b] For operating expenses.

Rolling stock.—Both locomotives were in the shop for repairs and changes in appliances. Steam brakes were substituted for the hand brakes with which the locomotives were originally equipped. Formerly sparks from the locomotives during dry weather kept the grass along the track in a blaze and endangered the buildings along the line. Extension fronts and up-to-date spark arresters were added to both engines. Driving wheel tires which had worn thin in the flanges were turned up to proper shape in turning lathe; better-shaped brake shoes were put on; new pilot put on No. 5; both engines painted and steam jets and rubber hose added to take water from canal wherever engines might be, instead of having to return to tank at Lock 6.

Three of the seven flat cars were kept in useable condition by making continual repairs; the others were completely worn out and their rebuilding was begun. The scrap pile was largely drawn upon for the work. The scrap pile contained over a hundred pairs of wheels and axles, the accumulation of the years since the beginning of the canal's construction. Some of them had worn-out journals, others had crooked or broken axles or one broken wheel. The wheels were pressed off in a hand-power screw press improvised for the purpose; the heaviest axles were welded and new journals turned on them, and the good wheels were bored out and shrunk on the axles. Patterns were made for cast-iron and brass parts, and scrap was used as far as possible to cast them. When completed, which will be early in July, we shall have four modern flat cars. With these to do the regular work, and the old ones to draw on in case of an emergency, we shall be in fairly good shape to take care of breaks in the embankment, should any occur.

Two hand cars, a velocipede, and the laborers' car were thoroughly repaired and painted. A push car was rebuilt for use of section gang.

TELEPHONE LINE.

Operation and repairs.—The lines have given better service than for any previous year since they were put up, due to the adoption of metallic circuit and long-distance instruments the preceding year. Trouble was had, in the woods through which the lines pass, by the falling of limbs and trees across the lines after every storm, but such damage was easily repaired. Last summer five condemned boat hulls were sunk in line, and at about equal distances apart, in the river just below the head of the lower canal. They were partially filled with rock, and it was designed to build upon them square cribs of 20-foot chestnut poles, each crib to be filled with rock up to high-water line and have a 40-foot telephone pole planted in its center. Three of the cribs were completed, and another was built and partially filled with stone. Low water has prevented the completion of the work, as the two unfinished cribs are on reefs and can not be reached with barges of stone except at high stages of the river. When this crossing is completed it will reduce the length of the line about half a mile, and will make the spans of such length (about 500 feet) and carry the wires so high that they will not be interfered with during high water. At present the crossing is made by passing from one towhead to another, some of the spans being a quarter of a mile long and the wire sags so low that high floating drift tears the wires out during every flood.

Cost of operation and maintenance of telephone lines.

Month.	Cost per mile.	Month.	Cost per mile.
1903—July	$0.31	1904—February	$0.31
August	.24	March	.90
September	.08	April	.88
October	.38	May	.51
November	6.26	June	.76
December	3.71		
1904—January	1.03	Average per month	1.21

MACHINE AND BLACKSMITH SHOPS AND FOUNDRY.

Operation and repairs.—New skylights were put on shop and roof repaired. Cast-iron blocks were made for raising head and tail stocks of the largest lathe to increase its swing from 24 inches to 38 inches. It was done for the purpose of turning off locomotive tires, but has come in conveniently for other work since, such as boring sprocket and pinion wheels for Kingman, etc. The machines were all cleaned, and the parts requiring it painted. In the foundry castings aggregating 19,306 pounds were made, at a cost for labor and material of 1.58 cents per pound.

SAWMILL AND CARPENTER SHOPS.

The mill operatives are employed on other work when the mill is not running. The sawyer and helper become carpenter's helpers and the laborers are put back where they belong. In this way the cost of sawing is cheap. The following table shows the number of feet B. M. sawed and planed during the year and the average cost of same:

Amount and cost of lumber sawed and planed.

Month.	Sawed.		Planed.	
	Feet B. M.	Cost per M.	Feet B. M.	Cost per M.
1903—July	11,242	$2.20	3,500	$2.28
August	19,664	2.11	15,250	1.03
September	9,796	3.08	2,078	2.00
October	17,650	2.24	16,801	.98
November	3,944	2.16	2,424	.62
December	3,323	2.96	4,400	1.99
1904—January	490	3.06	13.100	1.43
February	720	2.77	1,000	4.50
March	6,144	2.00	7,447	.69
April	4,055	1.44	5,700	1.16
May	2,380	1.79		
June	2,095	2.10	4,116	1.85
Total and average	81,503	2.27	75,816	1.28

Add to the above average cost of sawing the average cost of stumpage and hauling logs, and the lumber manufactured in the mill cost $12.27 a thousand feet. As much of the lumber was long white oak of first-class quality, for repairing boats and cars, the cost of it purchased in the market would not have been less than $25 a thousand.

Bevel gearing used to divert power from vertical shaft of turbine to horizontal shaft carrying pulley of belt that drives the saw did not work well. Provision for taking end thrust of the shafts was not sufficient to prevent the gears slipping out of mesh and breaking out teeth. A cast-iron pillow block was installed to give greater rigidity to shafts, and the gears were made of better quality. A mixture of one-fourth scrap steel and three-fourths No. 1 foundry iron was used in casting them. Less trouble has been experienced since the improvement was made. Other repairs were small, such as hammering saws, repairing roof, race, sawdust flumes, etc.

BUILDINGS.

Improvement and repair.—The following houses were painted: Lockmaster's house at Locks 1, 2, and 3; lockmen's houses at Locks A, 1, 2, 3, 4, 5, and 8; machine and blacksmith shops, and new storage house.

The lockman's house at Lock 1 was repaired and made ready for occupancy. A stone foundation was put under, and partitions built in it; porch, windows, and roof were repaired. The building has been used as a schoolhouse for children of canal employees for several years, but upon the appointment of a lockman for that lock the house was needed for his residence. Repaired lockmen's houses at Locks A, 5, 6, and 8; cut door between two rooms in lockmaster's house at Lock 2; built cover over cistern at Lock A; repaired porches, windows, etc., of lockmaster's house at Lock 1, enlarged kitchen at foremen's quarters, and painted porch floors of same; repaired damage done by lightning striking lockmaster's house at Lock 4; put new floor in kitchen of assistant engineer's quarters; repaired engine shed, putting on new doors and frames; built stone foundations under white laborers' quarters and paint shop; moved kitchen and ceiled kitchen and pantry of lockmaster's house at Lock 9. Small chicken houses were built for use of employees residing at Locks 1, 3, 4, 8, and 9.

When property was moved from Keller Quarry in the spring to Lock 7 the office and quarters building was torn down and the lumber brought along. Nails were pulled out of the lumber, and it was dressed over for building a storage house 30 by 50 feet for storing heavy articles like engines, boilers, horsepowers, etc. The building is just below the dry dock, and fills the long-felt need of a place to put heavy stuff out of the weather when not in use. The number of buildings on the canal, exclusive of small outbuildings, has for the past few years been taken as 39. The new storage building brings the number up to 40 in the following table, which shows cost of repairs and improvements on buildings:

Unit cost of repairs and improvements of buildings.

Month.	Cost per building.	Month.	Cost per building.
1903—July	$2.13	1904—February	$1.28
August	2.93	March	6.46
September	4.02	April	6.61
October	5.07	May	6.08
November	5.81	June	.29
December	6.10		
1904—January	3.09	Average per month	4.16

QUARTERS AND GROUNDS.

Finished building and painting fence around headquarters inclosure, and rebuilt fence at Lock 4; whitewashed fences at Locks A, 2, 4, 5, and 6; built and painted fence around lockmaster's house at Lock 9; cleaned rock and trash off dry-dock inclosure. Quarried stone for and put 800 feet of curbing and 200 feet of stone side drain along drives at Lock 6. Drives and walks were kept in repair, and grass and weeds kept cut.

FLOATING PLANT.

Dredge Alabama.—Work of rebuilding the dredge was finally finished after a delay of several months from the failure of the Bucyrus Company to deliver parts of machinery ordered for it. The dredge was put to work October 15, but had to be brought back to the shop in November to put on the tumbler plates, new buckets, and links, washers, etc., ordered nine months before, but just received at that time. At the time the dredge was rebuilt it was thought that the liners of the discharge pipe would last another season, but two months' work wore them out, and new ones were put in during February. At the same time the hopper was readjusted and strengthened. The dredge was rebuilt with a special allotment of $8,000 made during the preceding year. Running repairs were charged in with cost of dredging.

U. S. S. Colbert.—Only such repairs were made to the *Colbert* as were necessary to keep it up. It was brought into use for only two periods during the year—once for a few days fanning mud out of head of canal, and again during February and March, making three trips to Chattanooga for coal, two trips to Riverton, and three trips to Keller quarry to bring plant from those places for storage at Lock 6, and one trip to Riverton to assist in bringing lower river dredging plant to canal. The boat had to be put in condition both for coming into service and for being laid up. Other repairs made were: Repaired deck, stairway, roof, lifeboat, wheel, furniture, etc.; rebuilt furnace, painted pilot house, roof, stairway, and engine room. Repairs and care of boat and property pertaining to it cost $635.49.

U. S. S. Kingman.—An engineer and stoker were kept on the boat all the time, and the canal pilot's time was charged to it when he was not otherwise engaged. The crew of the boat made the repairs as far as possible. The sprocket wheels, after a year's service, were worn out, and the chains were so badly worn that it was necessary to change patterns of wheels. New sprocket wheels and pinion and gear wheels were made and put on. New wheel flanges were put on, deck repaired, boiler repaired, and flues rolled. The boat was kept scrubbed and painted. The following trips were made: 28 to Florence, 19 to Lock A, 5 to Decatur, 3 to Riverton, 4 to Keller quarry, and 48 miscellaneous.

Kingman's barge.—Was docked, calked, and painted; new guards were put on and gunwales, bottom, and deck patched and calked.

Pontoon barge.—This barge, used as foot and wagon bridge above Lock 6, had its deck patched and calked.

Derrick boat (not numbered).—Was docked, cleaned, repaired, calked, and painted. Engine broke down, and was replaced with one formerly on derrick boat *No. 3*. Scale boards were rebuilt and pipe work overhauled. The boat was repaired for use until derrick boat *No. 3* could be brought into service.

Derrick boat No. 3.—Authority was obtained for rebuilding this boat at a cost of $1,650. The hull was made new throughout, and a cabin formerly on an old condemned quarter boat was put on it; a 10-ton double-drum hoisting engine was installed on it, and an extra boiler and engine for running a centrifugal pump, which was placed on the stern. The pump is to be used in pumping out lock pits for repairs, raising sunken boats, etc. The derrick boat was finished and is ready for service.

Barge No. 12.—Was docked, and deck and gunwales repaired; hole in bottom was repaired, and the barge calked and painted. The deck, which was well worn, was sheathed with 1-inch gum; the barge not being considered worth a new deck.

Barge No. 13.—Had same repairs as barge *No. 12*.

Barge No. 5.—This barge was sent with the *McPherson* to Hiwassee River in May, 1903. Returning to the canal, in December, it was sunk just below the Suck. When finally brought to the canal it had both rakes mashed in, and gunwales and deck were in bad shape. It was docked and repaired at a cost of $450.

U. S. S. McPherson.—Had new canvas roof put on and painted.

Skiffs.—One new skiff was built and three repaired.

Miscellaneous.—U. S. S. *McPherson*, lower river dredging plant, and snag barge—all not belonging to the canal—required constant attention during the time they were in the canal. The cost of caring for them and disposing of such floating plant condemned in June, 1903, was $316.34.

Dry dock.—The following boats belonging to the United States were in the dock for repairs: Kingman's barge, derrick boat (not numbered), derrick boat *No. 3* (rebuilt), and 3 barges. The dock and dock yard were cleaned of rubbish accumulated from repairs of boats.

MISCELLANEOUS.

The heaviest charge under this head was for building levee and digging ditch in front of and below the paved weir just above Lock 6. This weir, 907 feet long, was built after the canal was opened to navigation, and it was found that the masonry weir at the mouth of Six Mile Creek was not sufficient to take care of the floods of the creek. At times the paved weir discharges a solid sheet of water 18 inches deep over its crest, and no ample provision had been made to keep the water off the fields of private individuals between the weir and the river. A levee about 5 feet high was built from the upper end of the weir to the sawmill tailrace, and a ditch opened up between the levee and canal embankment.

Surveys of the road from Lock 6 to Huntsville road, and of land along canal between Lock 6 and Shoal Creek, and maps of same, were made for use in settling suits of M. C. Buxbaum for alleged damages to said land.

A survey of the entire lower canal from above Lock 1 to Lock 9 was made and part of it platted.

Other works under this head were: Cutting wood and hauling wood and coal to kitchens and quarters, hauling supplies from Florence, repairs to tools, wagons, and other appliances, and numerous other minor items.

Respectfully submitted.

W. S. WINN,
Assistant Engineer.

Maj. H. C. NEWCOMER,
Corps of Engineers.

C C 3.

IMPROVEMENT OF FRENCH BROAD AND LITTLE PIGEON RIVERS, TENNESSEE.

For description of the French Broad River see report of survey made in 1899, published in the Annual Report of the Chief of Engineers for 1900, page 3018.

The approved project proposes to remove surface obstructions, cut down overhanging trees, and build wing dams and training walls where necessary, so as to permit the passage of boats drawing 2½ feet during ordinary low-water season from the mouth to Leadvale, about 70 miles upstream.

The approved project for the expenditure of the funds available at the beginning of the fiscal year called for work at Red Bank shoals, Hanging Rock, and Campbells shoals.

Red Bank shoals (14 miles above the mouth).—The object of the work was to equalize slope of water surface, straighten channel, and obtain 3 feet depth at low water by construction and repair of training walls, spur dams, and submerged sill, and by dredging.

The work in detail, with cost, was as follows:

Stripping earth at quarry, 120 cubic yards	$75.00
Quarrying 5,500 cubic yards of rock	1,409.65
Excavating 2,540 cubic yards of rock and gravel from channel	310.34
Filling old crib, 990 cubic yards	113.60
Filling new crib, 1,475 cubic yards	278.50
Training wall and bank protection, 2,200 cubic yards	538.15
Placing in 11 dams 3,060 cubic yards	745.10
Removing 170 trees and stumps	34.65
Repair of plant, etc	657.65
Subsistence of employees	514.80
Hire of steamboat	514.75
Total	5,192.19

The total length of riprap dams built was 3,778 feet; the old crib bank protection was repaired for a length of 550 feet and 290 linear feet of new crib built.

Hanging Rock shoals (25 miles above mouth).—After completing the work at Red Bank the fleet was taken to Hanging Rock shoals for the purpose of restoring dams that had been pulled down or injured by ice, and dredging a channel through the bar opposite the lower end of Hanging Rock Island.

The work in detail, with cost, was as follows:

Dredging 490 cubic yards material	$73.50
Quarrying 550 cubic yards stone	165.00
Repairing 4 dams, 745 cubic yards	149.00
Repairing training wall, 30 cubic yards	6.00
Moving fleet, etc	38.42
Subsistence of employees	50.00
Steamboat hire	56.75
Total	538.67

Campbells shoals (8.5 miles above mouth).—The channel at this place is very narrow and tortuous, with submerged bars on either hand. It was materially improved by the construction of a dam 800 feet long, which defines the right side of the channel and prevents the water from spreading on that side.

The work in detail, with cost, was as follows:

Stripping earth in quarry, 120 cubic yards	$60.00
Quarrying rock, 1,110 cubic yards	332.00
Building dam, 1,050 cubic yards	210.27
Towing and transportation	88.50
Subsistence of employees	86.79
Survey	14.00
Total	791.56

The traffic on this river above the marble-quarry district, which extends but a few miles above its mouth, does not seem to justify any expensive work of improvement; an annual appropriation for removing snags and other channel obstructions, for repairing and maintaining existing works, and for work at any points where trouble may arise in the future, should suffice.

Money statement.

July 1, 1903, balance unexpended	$8,444.80
Proceeds sales	.08
	8,444.88
June 30, 1904, amount expended during fiscal year, for works of improvement	7,985.69
July 1, 1904, balance unexpended	459.19
July 1, 1904, outstanding liabilities	126.19
July 1, 1904, balance available	333.00
Amount (estimated) required for completion of existing project	65,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904	2,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

APPROPRIATIONS.

June 14, 1880	$10,000.00	June 3, 1896	$5,000.00
March 3, 1881	3,500.00	March 3, 1899	5,000.00
August 2, 1882	5,000.00	June 13, 1902	15,000.00
July 5, 1884	3,500.00		
August 5, 1886	6,000.00		95,000.00
August 11, 1888	10,000.00	July 10, 1903, proceeds of sales	.08
September 19, 1890	10,000.00		
July 13, 1892	15,000.00		
August 18, 1894	7,000.00	Total	95,000.08

COMMERCIAL STATISTICS.

French Broad River, Tennessee.

Articles.	Year ending December 31, 1903.	
	Tons.	Estimated value.
Brick	110	$480
Farm products	384	32,725
Fertilizers	83	1,660
Flour	34	1,530
General merchandise	1,300	121,250
Grain	2,957	67,425
Hay	590	10,620
Live stock	142	17,040
Logs	7,360	58,880
Lumber	24,468	305,975
Marble	22,000	440,000
Sand	41,250	27,500
Shingles	43	1,488
Straw	305	1,830
Wood	1,050	1,050
Total	102,076	1,089,453

Floated down in rafts (logs and lumber), 12,638 tons; number of passengers transported (1903), 1,156.

Details of the traffic for 1903 are shown in the following table:

Between what points.	Miles on French Broad River.	Passengers.	Tons.
Moved in rafts (logs and lumber):			
Newport, Tenn., to Knoxville	81.5	....	7,300
Dandridge, Tenn., to Knoxville	46.5	....	220
Hickory Ridge, Tenn., to Knoxville	42.0	....	1,020
Hendersons Landing, Tenn., to Knoxville	41.5	....	2,000
Catlettsburg, Tenn., to Knoxville	30.5	....	2,000
Sevierville, Tenn., to Knoxville	30.5	....	98
Moved by steamboats:			
Leadvale, Tenn., and Kingston, Tenn	69.5	806	25,765
Catlettsburg and Knoxville	30.5	....	200
Marble quarries on French Broad River and below Knoxville	5.5	350	17,250
Paint Rock, Tenn., and below Knoxville	3.0	....	46,000
Moved in flatboats, Dandridge to Knoxville	46.5	....	223
Total	....	1,156	102,076

Four steamboats were reported in the last annual report as plying on the French Broad River in the calendar year 1902. Since then the *Isabella King* has been withdrawn, and two additional boats—the *Clinch* and the *Jane Austin*, the latter a new boat, navigated the river in 1903, while the number of barges was increased from 25 to 47. The dimensions, etc., of the new boat are as follows:

Name.	Length.	Width.	Depth.	Netton-nage.	Height of pilot house.	Height of smoke-stack.	Number of barges.	Capacity of barges.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*		*Tons.*
Jane Austin	112	18	3.4	86	22	26	3	135

The total number of craft operating in the river during the year ending December 31, 1903, was 5 steamboats, of a total of 297 tons burden, net, and 47 barges of a total capacity of 1,965 tons, as shown by the list below.

List of boats and barges navigating the French Broad River during the year 1903.

Name.	Net tonnage.	Barges.		Between what points.	Miles on French Broad River.
		Number.	Tonnage.		
Bill Tate	70	25	1,050	Leadvale and Kingston	69.5
Flora Swann	57				
Jane Austin	86				
Oliver King	42	12	540	Marble quarries on French Broad River, 10 miles above Knoxville, to 10 miles below Knoxville.	5.5
Clinch	24	9	360	Paint Rock, Tenn., and third creek below Knoxville.	3.0
Barge		1	15	Dandridge and Knoxville	46.5
Total	279	47	1,965		

These steamboats are also reported as plying on the Tennessee River above Chattanooga, and on the Clinch River, and the *Bill Tate*, again, as having operated on the Holston River.

Comparative statement of commerce for the past ten years.

Year.	Tons.	Estimated value.	Year.	Tons.	Estimated value.
1894	41,398		1899	102,263	$779,705.10
1895	42,898	$1,333,962.60	1900	160,827	1,225,677.50
1896	249,204	1,469,835.00	1901	103,340	922,032.00
1897	70,756	617,255.80	1902	157,819	1,810,772.00
1898	124,960	928,361.90	1903	102,076	1,089,453.00

C C 4.

IMPROVEMENT OF CLINCH, HIWASSEE, AND HOLSTON RIVERS, TENNESSEE AND VIRGINIA.

(A) CLINCH RIVER.

For description of this river see report of survey published in Annual Report of the Chief of Engineers for 1901, page 2542.

No work was done during the year.

Complaint having been made that private parties had obstructed navigation by the construction of fish-trap dams, an investigation was made which showed that the complaint was well founded, several fish-trap dams having been built since the river was cleared of obstructions in 1902. The cases were placed in the hands of the United States attorney for the eastern district of Tennessee for prosecution.

Only work of maintenance on this river is recommended for the present.

Money statement.

July 1, 1903, balance unexpended	$928.87
Proceeds sales	.56
	929.43
June 30, 1904, amount expended during fiscal year, for works of improvement	31.20
July 1, 1904, balance unexpended	898.23
July 1, 1904, outstanding liabilities	28.84
July 1, 1904, balance available	869.39
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904 Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	2,000.00

APPROPRIATIONS.

June 14, 1880	$10,000.00
March 3, 1881	3,000.00
August 2, 1882	3,000.00
July 5, 1884	5,000.00
August 5, 1886	5,000.00
August 11, 1888	5,000.00
September 19, 1890	4,000.00
July 13, 1892	4,000.00
August 18, 1894	2,500.00
March 3, 1899	$8,500.00
June 13, 1902 (allotment)	3,000.00
	53,000.00
July, 1903, proceeds of sales of condemned property	.56
Total	53,000.56

COMMERCIAL STATISTICS.

Clinch River, Tennessee.

Articles.	Year ending December 31, 1903.	
	Tons.	Estimated value.
Brick	232	$1,014
Cane seed	21	441
Coal	415	830
Farm products	2,160	197,575
Fertilizer	933	18,660
Flour	120	5,400
General merchandise	9,866	1,184,740
Grain	10,667	242,687
Hay	1,749	31,482
Live stock	315	37,800
Logs	98,449	787,588
Lumber	21,600	270,000
Railroad ties	1,875	5,250
Sand	2,100	1,400
Shingles	43	1,487
Shucks	77	770
Stone	5,625	28,125
Straw	531	3,186
Telegraph poles	4,000	28,000
Wood	938	938
Total	161,716	2,847,373

Floated down in rafts, 102,448 tons; number of passengers transported (1903), 3,614.

Details of the traffic for 1903 are shown in the following table:

Between what points.	Miles on Clinch River.	Passengers.	Tons.
Moved in rafts (logs and poles):			
Speers Ferry, Va., to Chattanooga	166.6		46,100
Speers Ferry to Knoxville	166.6		4,000
Dungannon, Va., to Chattanoga	165.6		3,000
Jonesville, Va., to Chattanooga	88.8		20,600
Lee County, Va., to Chattanooga	88.8		299
Clinton, Tenn., to South Pittsburg	59.0		6,000
Clinton to Chattanooga	59.0		12,000
Lee County, Va., to Clinton, Tenn	29.8		1,449
Emory River to Chattanooga	3.7		3,000
Kingston, Tenn., to Chattanooga	.8		5,000
Kingston to Paintrock, Tenn	.8		1,000
Moved by steamboats:			
Clinton and Kingston, Tenn	59.0		7,725
Clinton, and Dayton, Tenn	59.8	50	850
Kingston and landing 50 miles above	50		267
Harriman, Tenn., and Dayton	3.7		175
Harriman and Chattanooga	3.7		685
Kingston and Chattanooga	.8	2,758	23,568
Kingston and Leadvale, Tenn	.8	806	25,765
Kingston and Knoxville	.8		233
Total		3,614	161,716

The seven steamboats reported in the last annual report as plying on the Clinch River were still in service during the year 1903. A new boat, the *Jane Austin*, was also engaged in the traffic on this river, and the number of barges was increased from 24 to 51. The dimensions, etc., of the *Jane Austin* have been given in the statistics for French Broad River.

The total number of craft operating in this river during the year ending December 31, 1903, was 8 steamboats, of a total of 495 tons burden, net, and 51 barges, of a total capacity of 3,455 tons, as shown on list below.

List of boats and barges operating in the Clinch River during the year 1903.

Name.	Net tonnage.	Barges.		Between what points.	Miles on Clinch River.
		Number.	Tonnage.		
Clinch	24	4	320	Dayton and Clinton	59.8
				Kingston and Clinton	59.0
		1	90	Harriman and Dayton	3.7
		9	360	Kingston and Knoxville	.8
City of Loudon	23	2	105	Kingston and 50 miles above	50.0
W. T. Gallaher	27	6	1,080	Harriman and Chattanooga	3.7
Bill Tate	70	25	1,050	Kingston and Leadvale	.8
Flora Swann	57				
Jane Austin	86				
Gasconade	74	2	200	Kingston and Chattanooga	.8
N. B. Forrest	134	2	250		
Total	495	51	3,455		

These steamboats, with the exception of the *City of Loudon*, are also reported as plying on the Tennessee River above Chattanooga, Tenn.; four of them, the *Bill Tate*, *Flora Swann*, *Jane Austin*, and *Clinch* as navigating the French Broad River, Tennessee, and the *Bill Tate* again as having operated on the Holston River.

Comparative statement of commerce for the past ten years.

Year.	Tons.	Estimated value.	Year.	Tons.	Estimated value.
1894	12,932		1899	185,691	$2,391,624.65
1895	68,900	$439,409.30	1900	132,511	1,462,294.75
1896	39,456	357,783.00	1901	164,586	1,633,103.58
1867	102,629	903,238.46	1902	129,925	2,272,348.00
1898	160,345	865,759.50	1903	161,716	2,847,372.00

(B) HIWASSEE RIVER.

For detailed description see Annual Report of the Chief of Engineers for 1901, page 2459 et seq.

The approved project for the Hiwassee River is for a navigable channel from its junction with the Tennessee River to the mouth of the Ocoee River of not less than 116 feet in width, 30 inches mean channel depth, and 3 feet maximum depth. To secure this channel work is required on 16 shoals.

Work during the year was confined to improving the channel at Mathews shoals (9 miles above the mouth) by dam construction and removing some rocky points projecting above the river bed. About 3,664 cubic yards of rock, nearly all of which was quarried, were placed in the dam, which was leveled and graded; part of the old dam was removed to a depth of 3½ feet; 30 cubic yards of rock which projected above the general level of the bottom at Mathews shoals, and 4 cubic yards of rock at Moore's reef were blasted and removed.

Any additional appropriations made should be spent on Agency shoals, just below Mathews shoals, and on Rogers shoals, just above.

With these shoals improved it is believed that an annual appropriation for removing snags and other channel obstructions, and for repairing and maintaining existing works, is all that will be justified by the present or prospective commerce on the river.

Money statement.

July 1, 1903, balance unexpended		[a]$6,199.19
June 30, 1904, amount expended during fiscal year, for works of improvement		6,087.07
July 1, 1904, balance unexpended		112.12
July 1, 1904, outstanding liabilities		23.04
July 1, 1904, balance available		89.08
Amount (estimated) required for completion of existing project		61,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1906, in addition to the balance unexpended July 1, 1904:		
For works of improvement	$5,000.00	
For maintenance of improvement	2,000.00	
		7,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		

APPROPRIATIONS.

August 14, 1876	$10,000	August 15, 1886	$2,500
June 13, 1878	10,000	August 11, 1888	1,000
March 3, 1879	3,000	September 19, 1890	1,500
June 14, 1880	3,000	June 13, 1902 (allotment)	10,000
March 3, 1881	1,500		
August 2, 1882	1,500	Total	46,500
July 5, 1884	2,500		

COMMERCIAL STATISTICS.

Hiwassee River, Tennessee.

Articles.	Year ending December 31, 1903.	
	Tons.	Estimated value.
Brick	165	$720
Cotton	50	12,000
Cotton seed	3	52
Fertilizer	200	4,000
Flour	40	1,800
General merchandise	275	26,125
Grain	3,080	65,300
Hay	200	3,600
Live stock	1,800	216,000
Logs	2,516	20,128
Lumber	60	750
Marble	60	1,200
Produce	480	39,650
Sand	300	200
Shingles	13	437
Straw	100	600
Tan bark	260	3,600
Telegraph poles	2,000	14,000
Wood	2,250	2,250
Total	13,852	412,412

Floated down in rafts, 6,266 tons; number of passengers transported (1903), 975.

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[a] The balance unexpended July 1, 1903, is $72.93 in excess of that reported in last annual report, consisting of balance in Treasury of an old appropriation, which had been dropped from the records when reports on this river were discontinued in 1898.

Details of the traffic for 1903 are shown in the following table:

Between what points.	Miles on Hiwassee River.	Passengers.	Tons.
Logs, poles, and wood rafted:			
Mouth of Ocoee River to Chattanooga, Tenn	34.7		2,400
Charleston, Tenn., to Chattanooga	19.0		3,866
Moved by steamboats and barges, mouth of Ocoee River and Chattanooga	34.7	975	7,586
Total		975	13,852

But one steamboat, the *Sam A. Connor*, of 63 tons burden net, with two barges of a total capacity of 100 tons, navigated the river during the year 1903.

Comparative statement of commerce for the past ten years.

Year.	Tons.	Estimated value.	Year.	Tons.	Estimated value.
1894	9,839		1899 [a]		
1895	8,876	$145,431.60	1900 [a]		
1896 [a]			1901 [a]		
1897 [a]			1902	16,041	$340,207.00
1898 [a]			1903	13,852	412,412.00

[a] Commercial statistics not obtained.

(C) HOLSTON RIVER.

This river is described in the report of survey published in the Annual Report of the Chief of Engineers for 1901, page 2518.

No work was done during the year. The balance of the allotment of $5,000 made July 1, 1902, from the appropriation of $18,000 in the act of June 13, 1902, for the Clinch, Hiwassee, and Holston rivers, is retained for the purpose of clearing the channel of overhanging trees and other obstructions, as the interests of commerce may demand, in accordance with the recommendation set forth in the report of the Chief of Engineers for the year 1901, page 469.

Money statement.

July 1, 1903, balance unexpended	$1,776.10
July 1, 1904, balance unexpended	1,776.10

APPROPRIATION.

July 1, 1902 (allotment)	$5,000

COMMERCIAL STATISTICS.

Holston River, Tennessee.

Article.	Year ending December 31, 1903.	
	Tons.	Estimated value.
Corn	195	$3,336
Hay	10	180
Iron, scrap	11	82
Logs	14,241	113,928
Lumber	1,260	15,750
Tiling	26	1,040
Total	15,743	134,316

Details of the traffic for 1903 are shown in the following table:

Between what points.	Miles on Holston River.	Tons.
Moved in rafts (logs and lumber):		
North Fork Holston River, Va., to Knoxville	154.5	2,501
Kingsport to Knoxville	142.5	8,000
Kingsport to Chattanooga	142.5	2,000
Surgoinsville to Knoxville	117.5	800
May Springs to Knoxville	57.0	200
Kingsport to Austins Mill	25.0	2,000
Moved by steamboat and barge, Indian Ridge and Knoxville	34.0	173
Moved by flatboats:		
Kingsport to Knoxville	142.5	43
Kingsport to landing 20 miles below	20.0	26
Total	....	15,743

The only steamboat traffic on the river during 1903 consisted of one trip, 34 miles up the river, made by the steamer *Bill Tate*, of 70 tons burden, net, with one barge of 45 tons capacity, which brought down a cargo of corn and hay. One barge of 74 tons capacity, built at Kingsport, Tenn., 142.5 miles up the river, was floated down with a cargo of tiling, scrap iron, and corn.

C C 5.

PRELIMINARY EXAMINATION OF ELK RIVER, TENNESSEE AND ALABAMA.

[Printed in House Doc. No. 211, Fifty-eighth Congress, second session.]

War Department,
Office of the Chief of Engineers,
Washington, December 1, 1903.

Sir: I have the honor to submit herewith for transmission to Congress report dated June 26, 1902, by Maj. John G. D. Knight, Corps of Engineers, on preliminary examination of Elk River, Tennessee and Alabama, authorized by the river and harbor act approved June 13, 1902.

This report has been referred for consideration by the Board of Engineers for Rivers and Harbors, as provided in sections 3 and 14 of said act, and attention is respectfully invited to the Board's report of January 3, 1903, in third indorsement thereon.

A detailed survey of Elk River was made in 1898–99, pursuant to the provisions of an act of Congress approved May 4, 1898. Final report thereon was submitted by Maj. Dan C. Kingman, Corps of Engineers, June 10, 1899, and printed in House Document No. 87, Fifty-sixth Congress, first session, and in the Annual Report of the Chief of Engineers for 1900, page 3077. In this report Major Kingman expressed the opinion that it would be impossible to secure navigation for small steamboats as far up as Fayetteville by any system of open-channel improvement, and that the improvement could only be effected by the use of locks and dams. Of these fifteen would be required, and the estimated cost was placed at $882,855.

In a preliminary report of January 10, 1899, on this survey (printed in H. Doc. No. 147, 55th Cong., 3d sess., and in the Annual

Report of the Chief of Engineers for 1899, p. 2308) Major Kingman presented an estimate of $4,000 for the removal of snags and other channel obstructions on the lower 35 miles of the river, together with the excavation of certain rock reefs at the mouth. This amount was appropriated by the river and harbor act approved March 3, 1899, the funds expended, and at the end of the ensuing fiscal year it was reported that navigation was possible by small steamboats at higher stages of the river.

As a result of the present investigation Major Knight reports Elk River to be not worthy of improvement, and his views are concurred in by the division engineer, Col. G. J. Lydecker, Corps of Engineers.

For the reasons given in its report the Board of Engineers expresses the opinion that it is not desirable that the proposed improvement should be commenced by the United States, and in this opinion I concur.

Very respectfully, your obedient servant,

G. L. Gillespie,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

REPORT OF MAJ. JOHN G. D. KNIGHT, CORPS OF ENGINEERS.

Engineer Office, United States Army,
Chattanooga, Tenn., June 26, 1902.

General: I have the honor to submit the following report of a preliminary examination of the Elk River, Tennessee and Alabama:

I have made this preliminary examination wholly by examining and studying a report, with maps and profile, of a detailed survey of the Elk River, Tennessee and Alabama, submitted by Maj. Dan C. Kingman, Corps of Engineers, June 10, 1899, which survey was made as required by the act of Congress approved May 4, 1898.

This report, with index map, was printed in House Document No. 87, Fifty-sixth Congress, first session, and again without Map in the Annual Report of the Chief of Engineers for 1900, Part 5, page 3077.

Major Kingman expressed the opinion that it would be impossible to secure a navigation for small steamboats as far up as Fayetteville by any system of open-channel improvement, and that the improvement could only be secured by the use of locks and dams.

Fifteen locks and dams, at an estimated cost of $882,855, would be required.

I concur in this opinion, but consider that in preparing an estimate of cost other items should be included besides simply the bare cost of locks and dams.

Of the 90 miles of river between Fayetteville and the Tennessee River, the upper 56 miles are in the State of Tennessee. On this section are 6 mills and dams, 7 road bridges, and 2 railroad bridges. Owners of the mills would be entitled to compensation for destruction or diminution of the water power utilized; and the partial rebuilding of road and railroad bridges to provide them with drawspans is another element of the indirect cost of the works of river improvement.

I have considered the cost to counties and railroads, for these, unlike the owners of the mill properties, would secure a return of the funds expended in the reconstruction of bridges only after resort to courts or Congress, if then.

Having in mind, then, the cost of the improvement to the United States, to the counties of Giles and Lincoln, and to the railroads for modification of bridges, I consider the river from Fayetteville down not worthy of improvement.

There is, however, a stretch of the river 15 miles long, below all mill-dams and bridges, which should be separately considered.

On this section the total fall is but 17.4 feet; but at two places the fall averages 4 and 5 feet per mile. With the low discharge of 489 cubic feet per second, improvement of these places by regulation works would be of very doubtful success. To overcome the fall by locks and dams would require the construction of two sets, the estimated cost of which, taken from Major Kingman's report, is $135,870.

The benefits to follow the improvement of this short section would be the water transportation of timber and crops, and would not be sufficiently great to justify the estimated cost. Therefore I consider the lower 15 miles of the Elk River not worthy of improvement.

By act of Congress approved March 3, 1899, the sum of $4,000 was appropriated for the partial improvement of this river, and was applied on the lower 37 miles, to the removal of sunken logs, snags, and fish-trap dams, making a cut through a reef at the mouth of the river, and building a training wall to confine and regulate the channel at the entrance.

At the close of the fiscal year June 30, 1900, Major Kingman reported that it was then possible to navigate the river with small steamboats at moderate stages of the river.

To conclude, having made a preliminary examination of the Elk River, Tennessee and Alabama, as above detailed, I consider this river to be not worthy of improvement.

Very respectfully,
JOHN G. D. KNIGHT,
Major, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY, CENTRAL DIVISION,
Cincinnati, Ohio, July 7, 1902.

Respectfully forwarded to the Chief of Engineers, United States Army.

I concur in the views and opinion expressed by Major Knight.

G. J. LYDECKER,
Colonel, Corps of Engineers,
Division Engineer, Central Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 13, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters Corps

of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

By command of Brig. Gen. Gillespie:

A. MACKENZIE,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 3, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Major Knight on the preliminary examination of Elk River, Tennessee, the indorsement of the division engineer upon the same, and statements submitted by interested parties.

In the opinion of the Board the great slope of this section of river and its small low-water discharge render its improvement without locks and dams impracticable. The cost of construction of locks and dams, when compared with probable benefits to commerce, compels the Board to believe that it is not desirable that improvement should be commenced by the United States.

For the Board:

H. F. HODGES,
Major, Corps of Engineers,
Senior Member Present.

C C 6.

PRELIMINARY EXAMINATION OF HIWASSEE RIVER, TENNESSEE, FROM THE MOUTH OF THE OCOEE RIVER TO THE FERRY AT HEAD OF JENKINS ISLAND.

[Printed in House Doc. No. 183, Fifty-eighth Congress, second session.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 1, 1903.

SIR: I have the honor to submit herewith a report, dated August 19, 1902, by Maj. John G. D. Knight, Corps of Engineers, on preliminary examination of Hiwassee River, Tennessee, from the mouth of the Ocoee River to the ferry at the head of Jenkins Island, made in compliance with a requirement in the river and harbor act approved June 13, 1902.

In the opinion of Major Knight, concurred in by the division engineer, Col. G. J. Lydecker, Corps of Engineers, and by the Board of Engineers for Rivers and Harbors, which has reviewed this report under the provisions of sections 3 and 14 of the above-mentioned act, the locality is not worthy of improvement by the General Government.

I concur in this opinion.

Very respectfully, your obedient servant,

G. L. GILLESPIE,
Brig. Gen., Chief of Engineers, U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

REPORT OF MAJ. JOHN G. D. KNIGHT, CORPS OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,
Chattanooga, Tenn., August 19, 1902.

GENERAL: I have the honor to report as to the preliminary examination of the Hiwassee River from the mouth of the Ocoee River to the ferry at head of Jenkins Island.

I was charged with the duty of making this examination by letter from the Chief of Engineers, United States Army, June 23, 1902.

The examination was directed by the river and harbor act approved June 13, 1902.

The river and harbor act of March 3, 1899, authorized a survey of the Hiwassee River from its mouth to the mouth of the Ocoee River.

The report of this survey was submitted September 13, 1900, by Maj. Dan C. Kingman, Corps of Engineers, and published in House Document No. 77, Fifty-sixth Congress, second session, and without maps, at page 2458 of the Annual Report of the Chief of Engineers for 1901.

That officer reports that the survey was extended to Savannah Ford, above the mouth of the Ocoee River, to develop the character of the Hiwassee above the junction.

The head of Jenkins Island is a few hundred feet above Savannah Ford, which, in turn, is 7 miles above the mouth of the Ocoee.

July 8, 1902, I went in a flat-bottom skiff, drawing about 4 or 5 inches, from a point about 2 miles above down to Savannah Ford.

The two men paddling—one at bow, the other at stern—managed to get the skiff over shoals above the ford.

At the head of Jenkins Island the river divides into three channels—the left was considered the main channel, but was obstructed by a bar at its head; the right channel was taken, and found obstructed by a bar at its foot, partly overgrown with grass; a third small channel connects these two, leaving the right channel a short distance below the head. The skiff rubbed as we descended the right channel. Neither channel is large enough for the transportation of freight, and could only be made so by extensive dredging and removal of tow-heads, which the course of the river indicates would not be of permanent effect.

The fall from the head of Jenkins Island to Savannah Ford is estimated at about 18 inches.

From Savannah Ford to the pool in which the Ocoee River empties, a distance of 6 miles, the Hiwassee falls 18.6 feet, and at one point of this section falls 10.62 feet in a distance of about 2 miles, attaining a maximum rate here of 45 feet to the mile.

From the discharge observed November 3, 1899, the extreme low-water discharge of the Hiwassee above the mouth of the Ocoee was computed to be 595 cubic feet per second; but at the time of my examination it was doubtless even less, as the river was said to be about 2 inches lower than the previously noted low-water stage.

The least depths at five shoals and rapids between Savannah Ford and the mouth of the Ocoee were 1, 1.6, 1.7, 2.8, and 1.8 feet.

In his report of September 13, 1900, Major Kingman stated that the 6 miles of the Hiwassee River, above the mouth of the Ocoee, did not seem worthy of improvement at that time.

Certainly the obstructions here can only be overcome by locks and dams. By their aid, and after dredging and dry cutting, boats might go 5 or 6 miles above Savannah Ford.

Above this point a personal inspection of the river for about 25 miles has convinced me that it is not navigable even for rafts.

From the Ocoee down, the present project contemplates a channel 40 feet wide and 2 feet deep at low water. Boats using this channel at that stage should not draw more than 18 inches.

Above Savannah Ford, the direct benefits attending improvement would be to afford a water transportation route for moving the output of sandstone and quartzite quarries by very light-draft boats; the indirect benefits might be a reduction of railroad rates on this material.

There are deposits of iron ore at varying distances from the banks of the Hiwassee, but I doubt if the water transportation furnished, were the river improved as above, would justify the ore following the river route.

My conclusion is that the Hiwassee River from the mouth of the Ocoee to the head of Jenkins Island is not worthy of improvement.

Very respectfully,

JOHN G. D. KNIGHT,
Major, Corps of Engineers.

Brig. Gen. G. L. GILLESPIE,
Chief of Engineers, U. S. A.
(Through the Division Engineer.)

[First indorsement.]

ENGINEER OFFICE, U. S. ARMY, CENTRAL DIVISION,
Cincinnati, Ohio, August 20, 1902.

Respectfully forwarded to the Chief of Engineers, United States Army.

I concur in the conclusions expressed by Major Knight, that the section of river referred to in his report is not worthy of improvement by the United States.

G. J. LYDECKER,
Colonel, Corps of Engineers,
Division Engineer, Central Division.

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, U. S. ARMY,
August 26, 1902.

Respectfully referred to the Board of Engineers for Rivers and Harbors, constituted by Special Orders, No. 24, Headquarters, Corps of Engineers, current series, for consideration and recommendation, as required by section 3 of the act of June 13, 1902.

A. MACKENZIE,
Acting Chief of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 6, 1903.

Respectfully returned to the Chief of Engineers, United States Army.

The Board of Engineers for Rivers and Harbors has considered the within report of Major Knight on the preliminary examination of

Hiwassee River, Tennessee, the indorsement of the division engineer upon the same, and statements submitted by interested parties.

In the opinion of the Board the slope of this section of river is so great as to render open-channel improvement impracticable, and the probable benefits to commerce are not sufficient to warrant the construction of locks and dams. The Board is therefore compelled to believe that it is not desirable that the United States should commence this improvement.

For the Board:

H. F. Hodges,
Major, Corps of Engineers,
Senior Member Present.

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